Case Study: Fitting of an individual multi-curved silicone hydrogel contact lens after chemical burn

The experienced lens fitter would generally choose rigid gas permeable lenses for the treatment of irregular astigmatism as visual acuity results are usually expected to be better. Depending on topography the market offers at present a wide range of excellent lens designs. However, in many cases the problem remains that despite an objectively well fitted lens the patient will not tolerate potentially high loss rate and lack of comfort associated with RGP wear. Over recent years silicone hydrogels have established1 themselves as a strong alternative to RGP's. This case will demonstrate the successful care of a burnt and cauterized eye with a multi-curve Silicone Hydrogel lens. By Stephan Degle and Stefan Facher

CASE HISTORY

The 25 year old young man was a dedicated fistball player at league level. He was also a skier and snowboarder. He sustained an injury to his left eye on New Year's Eve 2002/2003 when a firework exploded immediately in front of his face. The initial diagnosis at his local eye clinic was burn/chemical burn of the direct ocular surface and the adjacent structures in the left eye. The right eye was unaffected. After 17 days of acute medical care the patient was transferred to an ophthalmological university medical center on the 17.01.2003 where the first plastic surgery was performed. Further stabilization of the cornea was repeated in the following years. Despite surgical removal, reoccurring nasal cunjunctival pannus hindered the fitting of a RGP lens. Furthermore an eyelid correction had to be performed twice, due to trichiasis.

After a total of 13 surgical operations, including lamellar keratoplasty from the right to the left eye, and stem cell transfer, the condition of the front eye section was stabilized by March 2009. During the hospitalization and in an external contact lens institute two attempts of fitting RGP lens were unsuccessful. The patient noticed a gradual improvement of visual acuity after each treatment; nevertheless a satisfactory fit could not be achieved due to reduced comfort levels caused by the corneal and conjunctival erosion. The problem-free use of a silicone hydrogel bandage lenses during treatment initiated the following approach.

First Examination
Rx (VD=14mm):
OD S plano, VA 25/20
OS S+2.75 C-4.75 X180, VA 20/120 SC ,
VA 20/50 CC (w glasses)

The healthy right eye did not require correction. Spectacles were not advisable in this case due to the anisometropia which was not tolerable. Binocular balance testing (Schober) could not establish binocular vision. The agreed treatment target was to improve the monovision in the left eye and to achieve a measure of binocular visual function. Figure 1and 2 depict the view on the cornea through the slit lamp with and without Fluoroscein. In figure 2 the superficial punctate keratopathy in the inferior quadrant is noticable which is caused by the functunal restriction of the tear duct, as a consequence of the impact and the resulting surgery, and minor Triachisis. Due to the numerous actions taken to stablise the cornea, a minor corneal haze remained. The topography and cornea geometry were obtained by keratography and pentacam HR (figure 3-4). The irregular corneal topography and reduced thickness is obvious.

LENS FITTING

For the treatment of this case, a conventional moulded contact lens was ruled out. The use of individual contact lenses was also eliminated due to the lack of suitable peripheral geometry ranges.

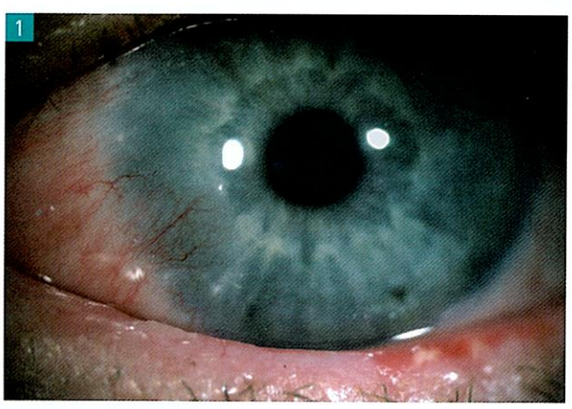

Fig. 1: Slit lamp findings

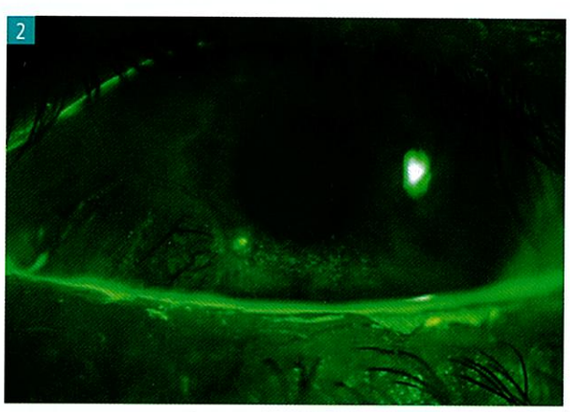

Fig. 2: Slit lamp findings with fluorescein

In order to supply the fragile cornea with sufficient oxygen, a high DK was mandatory. Furthermore it was necessary to find an economic fit as a frequent lens change would be needed in order to reduce the risk of infections. Considering the parameters and challenges above the Toris-OP by Swiss Lens SA (Prilly, Switzerland) was chosen.The Toris-OP is a soft contact lens for post surgical applications such as Lasik, Keratoplasty etc.. The lens is available in a two and three curved geometries, with individual fitting parameters (figure 5). For this particular case the s1s design with two curves was chosen. It was vital to achieve an acceptable optical zone with a satisfactory central fit in order to accommodate the nasal cunjunctival pannus and therefore prevent a tight fitting. As a result of the eyelid surgery and the resulting reduced tear flow, attention was also turned to providing a lens with sufficient tear wetting in order to prevent further superficial punctate keratopathy in the inferior corneal quadrant.

First Lens (Trial Lens)
Taking account of the topography the first lens chosen to measure the stabilization and over refraction had the following parameters:
Toris-OP s1s SL3 r_0 9.40/ r_1 8.9; $Ø_0$ 11.0/ $Ø_1$ 14.40; S+2.75
Contamac Definitive 74 Version III
After a 45 minute wearing period:
Over refraction: S plano C-5.25 X175; VA 20/40, lens stabilization in 175 TABO

Spontaneous centering of the lens and stabilization were good. However, the movement was poor. The assessment with fluosoft displayed a very tight peripheral fit. The wearing comfort for the patient was consequently very good. After removing the lens the amount of superficial punctate keratopathy increased due to the tight fit in the lower eyelid region (figure 6). The over refraction was included in a second flatter fitting lens.
Spontaneous centering of the lens was good and demonstrated a

Second Lens
Toris-OP s1s SL3 r_0 9.50/ r_1 9.0; $Ø_0$ 12.0/ $Ø_1$ 14.40; S+2.75
C-5.00 X175
Contamac Definitive 74 version III
After a 45 minute wearing period:
Over refraction: S+1.75 C-1.75 X13;
VA 20/30, lens stabilization in 177 TABO

noticeably better movement than the first lens. There was an over refraction measurement which resulted in the vision increasing from VA 20/50 to 20/30. The wearing comfort was negligibly worse. As the visual acuity increased we decided to order a third lens with the same geometry but allowing for the over refraction.

Third Lens
Toris-OP s1s SL3 r_0 9.50/ r_1 9.0; $Ø_0$ 12.0/ $Ø_1$ 14.40; S+4.31
C-6.38 X180
Contamac Definitive 74 version III

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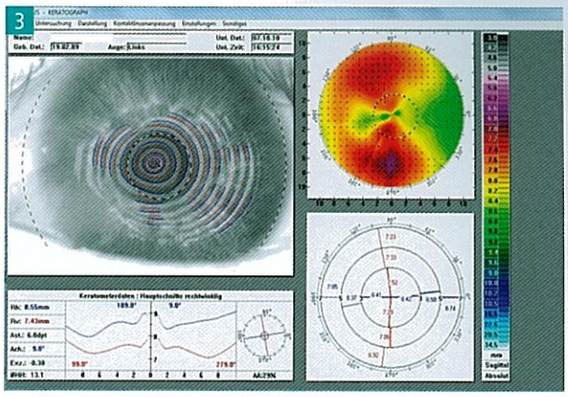

Fig. 3: Keratography overview

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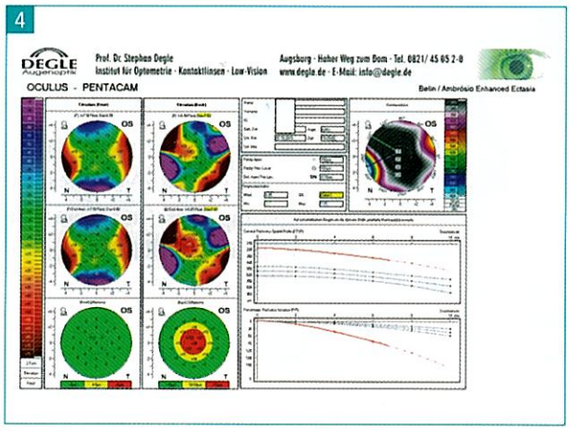

Fig. 4: Scheimpflug measurement; analysis of corneal topography according to Belin/Ambrosio

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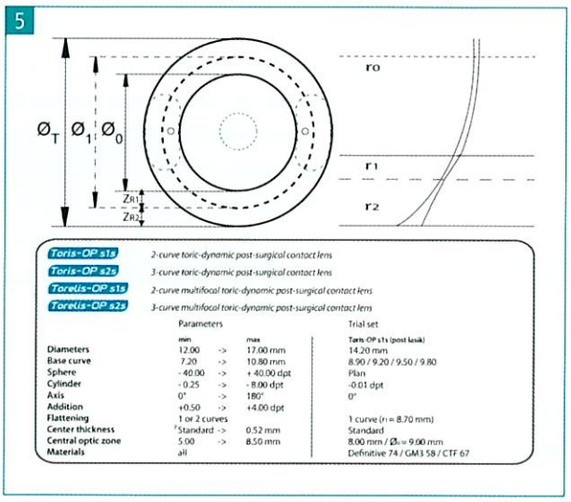

Fig. 5: Design and parameter availability of Toris-OP, Swiss Lens

The lens stabilized well along 178° as expected. The movement and stabilization settled after 45 minutes, good with a constant VA (lens) of 20/30. The patient perceived the lens as noticeable but not uncomfortable.
We decided to proceed with a follow up check after seven hours.

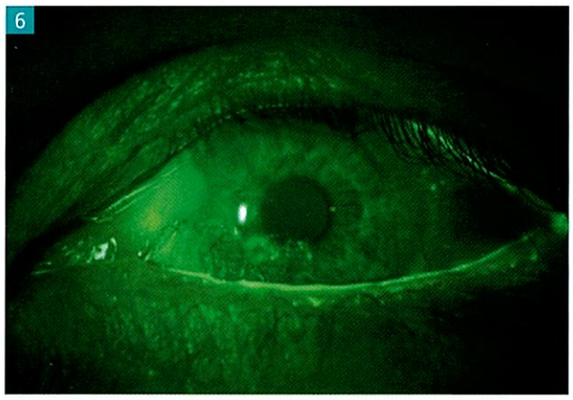

Fig. 6: Fluoroscein findings, 1st lens (45 min.)

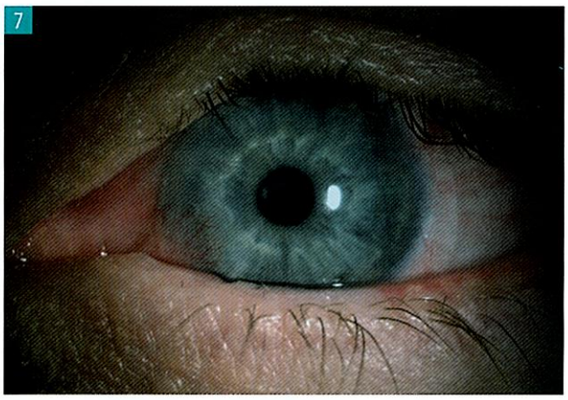

Fig. 7: 3rd lens suitable for dispensing

After seven hours the fitting performance and the vision were still constant and unchanged. Binocular vision was possible whilst undergoing the 'Schober-Test'. The lens was easily removable. After removing the lens assessment with the slit lamp showed the cornea remained clear. A fluorescein assessment demonstrated that the superficial punctate keratopathy was unchanged and possibly improved (figure 2). The lens seemed to demonstrate a bandage effect on the cornea and protected from dehydration, friction and erosion. Using the pentacam there was no thickening or edema visible.

The third lens will provisionally be the final lens. If necessary a further optimizing fit will be conducted after three months. The patient has been cautioned about the careful application of the lens, the necessity of good hygiene and compliance in order to prevent complications. Encouraged by its liberty of preservatives and in order to achieve a good disinfectant effect the Peroxide system AOSeptPlus by Ciba Vision has been chosen. Prior to the application the patient was advised to thoroughly rinse the lens with NaCl solution. A frequent follow up check is guaranteed due to three monthly change intervals.

DISCUSSION

The achieved visual acuity of 20/30 exceeded our expectations. Without any considerable loss in comfort and corneal modification, a wearing period of eight to ten hours was achieved. With good tear care with wetting agents containing hyaluronate and dexpanthenol the wearing period could even be increased to twelve hours.

With this silicone hydrogel soft lens the patient was able for the first time in eight years to see binocularly.

With sport, primarily fistball, the binocular vision resulted in an increased perception of 'depth of field' and assessment of speed which was received very positively by the patient.

CONCLUSION

Despite the initial scepticism based on the current opinion of utilizing RGP lenses due to their higher visual acuity for irregular astigmatism correction, it was proven true that the choice of a multi curve individual silicone hydrogel lens was correct. As two previous RGP fitting attempts had to be discontinued and due to the apparent challenge of the nasal cunjunctival pannus the decision was to attempt this way of fitting an individual silicone hydrogel contact lens. There was a good cooperation in this trail with Pascal Blaser, Product Manager of Swiss Lens SA.

The choice of a high DK material with good surface wettability, such as Contamac's silicone hydrogel Definitive version III, is essential. A regular check-up on erosion with fluoroscein and monitoring of the cornea metabolism with inspections on haze, including checks on endothelial changes and edema are mandatory. On the part of the patient a good compliance with controlled wearing periods and suitable hygiene is required. ■

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