Practitioner Learning Curve in Fitting Mini-scleral Contact Lenses in Irregular and Regular Corneas using a Fitting Trial

[1]Rute J. Macedo-de-Araújo, [2]Eef van der Worp, [1] Ana Amorim-de-Sousa [1]José M. González-Méijome

[1]Clinical & Experimental Optometry Research Lab (CEORLab). Center of Physics. University of Minho. Braga. Portugal
[2] Maastricht University, Maastricht, The Netherlands.

Universidade do Minho
Escola de Ciências
Centro de Física

Clinical & Experimental Optometry Research Lab

rjfmaraujo@gmail.com

Introduction

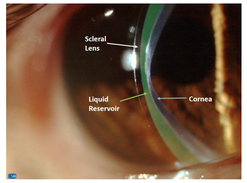


Figure 1. Schematic image of a ScCL covering an irregular cornea. Notice the liquid reservoir promoted by this lens which covers the entire cornea without touching it.

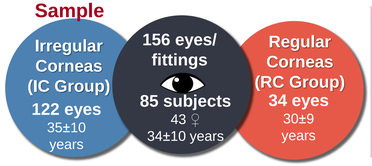
There is increasing evidence that scleral supported rigid gas permeable contact lenses (**Figure 1**) are suitable to compensate a wide range of corneal conditions derived from primary corneal disease, post-surgical complications and even in normal corneas. [1-3] The recent rebirth of scleral contact lens (ScCL) has been accompanied by a more predictable fitting process, but there is still a significant degree of uncertainty due to the few clinical available devices for objective measure anatomical features of the ocular surface beyond the corneal borders.

Fitting recommendations given by several manufacturers use to consider only the clinical features and the degree of severity of the corneal condition to decide the starting point for fitting. Few studies however report the success rate of the fitting process.

Purpose: To assess the learning curve of a novel practitioner with minor previous experience with ScCL fitting in the initial 156 consecutive scleral contact lenses fittings in irregular and regular corneas using a fitting trial.

Methods

Sample



Scleral Contact Lenses

Procornea (Eerbeek, the Netherlands) with Boston XO material.

Procedure

The first 156 consecutives ScCL fittings were analyzed.

1 Fitting Trials

Trial Lenses
- Trials using a fitting trial following manufacturer's recommendations
- Record the number of trial ScCLs required in each individual eye to achieve the optimal fitting to be prescribed.

2 Lens Dispensing & Follow-up

Re-orders
- Fitting Evaluation
- Record of the number of alterations (re-orders) needed after the first dispensed lens and respective motive

- The number of lenses with peripheral toric designs were also recorded.
- The results are divided in 8 chronological groups of 20 fittings (eyes) each.

Results

Number of Trial Lenses (Figure 2)

- The average number of trail lens per eye was 1.85±0.71 (1.84±0.69 on Irregular Corneas Group and 1.88±0.77 for Regular Corneas Group, with a range between 1 and 4 lenses per eye in both groups). There were no statistical significant differences between groups (p=0.970);
- There was a decrease in the number of trial lenses: from 2.35±0.18 lenses in the first 20 fittings to 1.56±013 in the last 20 fittings (p<0.05);
- After fitting number 60, the mean number of lenses began to be statistically significant lower than the first 20 fittings (p<0.05);

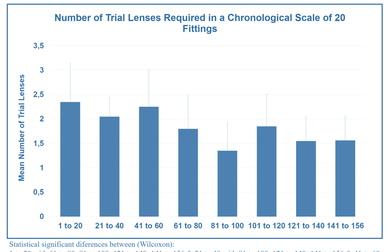


Figure 2. Mean number of trial lenses required to achieve the best fit. Data is in a chronological scale of 20 fittings.

Number of Re-orders (Figure 3)

- The average number of re-orders was 0.76±0.77, being 0.73±0.07 (range 0 to 4 lenses) on Irregular Corneas Group and 0.88±0.14 (range 0 to 3 lenses) on Regular Corneas Group. There were no statistical significant differences between groups (p=0.303);
- There was a decrease of almost 1 re-order per eye, from 0.95±0.17 in the first fittings to 0.25±0.11 in the last fittings (p<0.05);
- After fitting number 60, the mean number of re-orders began to be statically different than the first 20 fittings (p<0.05, Wilcoxon);
- In this sample, 48% required 1 lens exchange, 9% required 2 exchanges and 4% required 3 or 4.

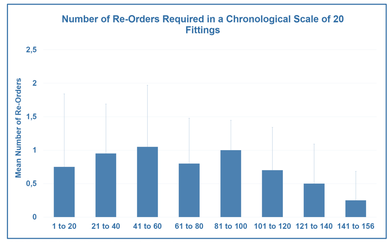


Figure 3. Mean number of re-orders required after the first lens dispense. Data is in a chronological scale of 20 fittings.

Cause of Re-orders (Table 1)

- The vast majority of reorders were because of inadequate sagittal height (approximately 30% in both groups) and poor vision requiring power adjustments after over-refraction (between 23.6% in IC group and 33.3% in RC group).

Table 1. Cause of lens re-order in each group
IC – Irregular Corneas
RC – Regular Corneas

	TOTAL fittings (n=156)	IC Group (n=122)	RC Group (n=34)
Inadequate Sagittal Height (only)	**36 (30.3%)**	27 (30.3%)	9 (30%)
Inadequate Landing Zone (only)	**7 (5.9%)**	5 (5.6%)	2 (6.7%)
Poor Fit (inadequate sagittal height & landing zone)	**14 (11.8%)**	11 (12.4%)	3 (10%)
Poor Vision	**23 (19.3%)**	21 (23.6%)	2 (6.7%)
Poor Vision & Poor Fit	**21 (17.6%)**	11 (12.4%)	10 (33.3%)
Discomfort	**12 (10.1%)**	9 (10.1%)	3 (10%)
Lens Broke	**6 (5%)**	5 (5.6%)	1 (3.3%)

Lens with landing toric geometry (Figure 4)

- There was a trend to use more landing zone toric designs over time (from 35% in the first fittings to >90% after fitting number 40).

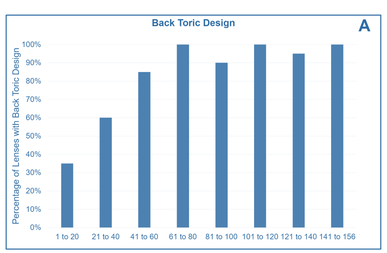


Figure 4. Percentage of landing zone toric designs fitted. Data is in a chronological scale of 20 fittings.

Discussion

Many experts mention the steep learning curve in fitting ScCLs, however there are no peer-reviewed publications on this theme. Studies with corneal RGP report the need of 1 to 5 lenses, with a mean of 2.3[4] and 1.73[5] trial lenses per eye to achieve the best fit. According to our results, a mild-experienced ScCL fitter will need less trial lenses (1.50 on average), with a reduction of 1 trial lens per eye with experience, that could mean also a chair-time reduction.

Regarding the re-orders, we found a 40% optimal fit rate in the first lens ordered – with RGPs, others have reported 77%[4] and 33%[6].

Regarding the prescribing pattern of toric landing zone lenses, it could be challenging to prove that the augment in the number of fittings with this design is a change in the practitioner skills, since those subjects with toric scleras could present at any time during clinical trials.

The trends shown in this study could be affected by asymmetry of more challenging or easier to fit cases that might appear at any time during the course of the study. However, the large sample recruited and uniformity in inclusion and exclusion criteria should contribute to a uniform distribution of cases with different degrees of difficulty.

Conclusions

- ScCLs can be fitted in most cases of moderate-to-severe ocular corneal defects and regular shaped corneas by practitioners with minimal previous training using a fitting trial.
- Practitioner experience allowed to reduce both number of trial lenses required to achieve the best fit and the number of re-orders.
- Approximately 41-60 fittings were required before obtaining a significant reduction in the trial lenses and re-orders necessary.
- There is a trend towards using landing zone toric designs more frequently as practitioner´s clinical practice increases.

References

1. Pullum KW, Buckley RJ. A study of 530 patients referred for rigid gas permeable scleral contact lens assessment. *Cornea*. 1997;16(6):612-622.
2. Bergmanson JPG, Walker MK, Johnson LA. Assessing Scleral Contact Lens Satisfaction in a Keratoconus Population.*OptomVisSci*. 2016;93(8):855-860.
3. Severinsky B, Millodot M.Current applications and efficacy of scleral contact lenses-A retrospective study.*JOptom*. 2010;3(3):158-163.
4 - Romero-Jiménez M, Santodomingo-Rubido J, González-Méijome JM. An assessment of the optimal lens fit rate in keratoconus subjects using three-point-touch and apical touch fitting approaches with the rose K2 lens. *EyeContactLens*. 2013;39(4):269-72.
5. Mandathara Sudharman P, Rathi V, Dumapati S. Rose K lenses for keratoconus—na Indian experience. *EyeContactLens*. 2010;36(4):220-2.
6. Betts AM, Mitchell GL, Zadnik K. Visual performance and comfort with the Rose K lens for keratoconus. *OptomVisSci*. 2002;79(8):493-501.

Acknowledgement and Disclosure

The authors would like to thank Procornea and Ron Beerteen. This work has been funded by a Research Grant form Bausch+Lomb (Wilmington, Massachusetts, USA). Partially funded also by Strategic Funding UID/FIS/04650/2013 assigned to Center of Physics (CFUM) and competitive projects PTDC/SAU-BEB/098392/2008, PTDC/SAU-BEB/098391/2008, PTDC/FIS-OPT/0677/2014 granted to CEORLab-CFUM by FCT-Portugal. None other author has a financial interest in the brands and materials mentioned.

FCT Fundação para a Ciência e a Tecnologia
Governo da República Portuguesa
European Union — Structural Funding