PREVALENCE OF RESIDUAL ASTIGMATISM FOLLOWING SCLERAL LENS WEAR IN KERATOCONUS PATIENTS: A RETROSPECTIVE STUDY

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INTRODUCTION

- Over-refraction on scleral lenses can induce residual astigmatism (RA), which is the result of either (1,2,3)
  - A. Presence of High Order Aberrations (HOAs) – Vertical or Horizontal Coma
  - B. Non-uniformity of the tear reservoir due to misalignment
  - C. Lenticular astigmatism
- Management of RA involves refitting the lens to improve centration, which may imply the use of toric peripheral curves and/or reducing the lens diameter; the use of a front-toric design or customized wavefront corrected front surface.

RESULTS

- The data of 669 eyes was collected; lenses with front-toric designs (110 eyes) were excluded.
- Subjects were fitted with 17 different designs but were considered as 2 groups for analysis (see Table 1).
- The subjects' mean age was 37.63+/-13.42, with a 42.7% female and 57.3% male population.
- RA was identified with a spherical-toric over-correction, with mean RA values of -0.26+/-0.41 D for G1 and -0.25+/-0.42 D for G2 (see Graph 1)
- The presence of RA is statistically significant when corneal toricity is greater (F=10.88, p=0.001)
- However, RA is not statistically significant based on the diameter of the lens (t test p=0.4557)

DISCUSSION

- The presence of coma in KC is well known and is generated by both corneal surfaces.
- Anterior corneal aberrations are fully compensated by tear reservoir
- However, back corneal surface generated aberrations remain uncorrected and may significantly disturb visual acuity.
- Coma is optically described as an image focusing partly in front and partly in back of the retina.
- Consequently, visual disturbance related to the presence of HOA (comas) is partly compensated with the use of toric lenses.
- Such use is misleading practitioners to believe that residual astigmatism exists.
- Another misconception is that residual astigmatism is related to lens flexure, which is not the case as proven by previous studies (4, 5)
- This is why increasing lens thickness does not help to fix the issues, and, to the contrary, may contribute to increase hypoxic stress to the cornea.
- High levels of unfixed HOA presence may represent a contra-indication for scleral lens use in KC patients, especially those reaching near normal visual acuity in glasses.

PURPOSE

- To evaluate the presence and the amount of RA post-scleral lens fitting in a population of keratoconus (KC) patients.

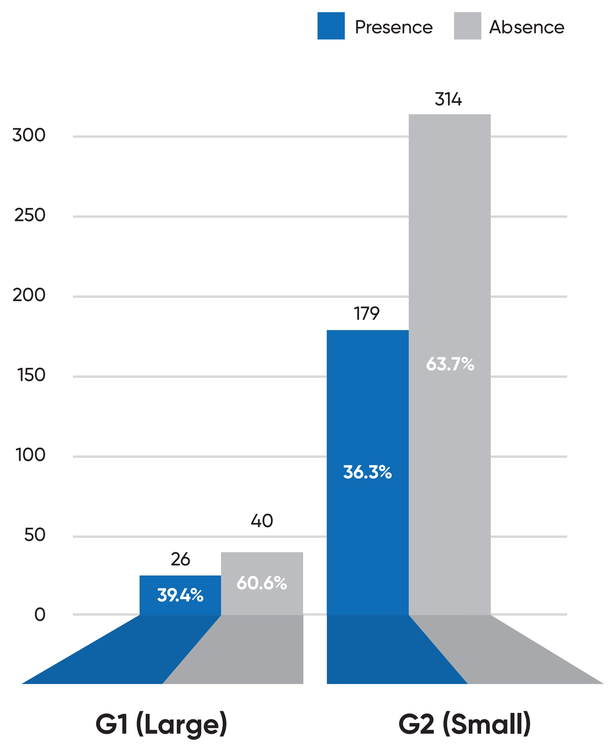
METHODS

- Retrospective study conducted after approval of the institutional IRB.
- All files of KC patients fitted at the Université de Montréal School of Optometry clinic between 2012 and 2017 were reviewed.
- Data extracted: patient gender and age, type of lens fitted (diameter, BC, power), over-refraction and central corneal toricity (Sim K- axial map- Medmont).

Table 1: Lens Groups

G1 – Large Lenses (≥ 15.4 mm)	G2 – Small Lenses (< 15.4 mm)
Europa	OneFit
EyePrint Pro	OneFit 2.0
Maxim 15.4	OneFit 2.0 Asian Profile
Maxim 4	OneFit 2.0 Multi Focal
Maxim 5R	OneFit 2.0 Lenticular
Maxim 7	OneFit 2.0 Reverse Geometry
Maxim 7 XII	OneFit P&A
OneFit MED	OneFit Keratoconus Profile
Zenlens	

Graph 1: Presence of Residual Astigmatism vs. Lens Group



CONCLUSION

- A majority of keratoconus patient fitted with scleral lenses present low levels of RA, not clinically significant enough to correct as their presence did not impact final VA.
- However, the 110 subjects excluded from the analyzed data demonstrated enough RA to require initial lens modifications, which means that in reality there is a greater percentage of subjects presenting RA.
- The presence of RA is higher with elevated corneal toricity and is not impacted by the diameter of the lens.

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