Simplifying Scleral Lens Fitting in the Presence of Localized Elevations with a New Corneo-Scleral Topography System: Notches and Lifts

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INTRODUCTION

Scleral lens fitting is complicated by scleral irregularities such as blebs, nodules, and pingueculae. Designing scleral lenses to fit over or around irregularities poses unique fitting issues. A new corneo-scleral topography device and software (sMap3D, Precision Ocular Metrology) is now able to accurately map these irregularities, quantify the size and location, and custom design scleral lenses with notches or lift areas that will fit over or around them, decreasing chair time and lens remakes as illustrated by the 3 case reports below.

CASE STUDY 1: PRECISION LIFT VAULT OVER OVER NASAL PINGUECULA OS (SALZMANN’S DEGENERATION RESULTED IN BOTH CORNEAL AND SCLERAL IRREGULARITIES)

Case 1 was a 44 year old male with Salzmann’s Degeneration OS (Figure 1A Slit lamp image. Figure 1B Corneal topography) referred for scleral lens fitting. Patient was a truck driver and needed optimal vision. Figure 3A is an sMap3D scleral elevation image with the elevated pinguecula seen in red. The software has a built-in ruler which can measure the length and width of the elevation (magenta lines). The circumferential scleral shape graph (Figure 3B) plots the Axis in degrees on the X-axis and the SAG value on the Y-axis circumferentially in this case at a radius of 8mm (diameter of 16mm) from the corneal center; the oval encircles the pinguecula and a data cursor function provides axis and SAG values at any desired point in this case allowing measurement of the pinguecula elevation at 16mm (text box).

DISCUSSION / CONCLUSION

The sMap3D corneo-scleral topographer identifies and quantifies size, shape and location of scleral irregularities, suggests a custom scleral lens design, and predicts the fit of that scleral design. The software is able to “cut out” the elevated area in the virtual fit allowing more accurate assessment of base curve (BC) to achieve desired central clearance and peripheral fit. Information this device/software combination provides dramatically simplifies successful fitting of scleral irregularities.

CASE STUDY 2: PRECISION LIFT VAULT OVER NASAL PINGUECULA OU (S/P LASIK WITH HYPEROPIA AND CENTRAL SCARRING)

Case 2 was a 35 year old S/P Lasik with hyperopia and some central scarring OU referred for scleral lens fitting. Patient was a truck driver and needed optimal vision. Figure 1A demonstrates the corneal/scleral elevation topography map, 1B the clinical photo and 1C the circumferential scleral shape map of the right eye all showing an elevated nasal pinguecula (red circle in all figures). The steeper area adjacent to the pinguecula in the superonasal quadrant in Figures 1 and 2 is marked by a blue circle/oval. Figure 2A shows the 3 dimensional virtual sagittal fit of a spherical haptic Europa scleral lens to this eye. There is touch (red circle) at the area of the pinguecula which is causing lifting of the lens over the superonasal area causing edge lift (blue circle/oval). This is also seen in the simulated fluorescein pattern in Figure 2B. In order to properly fit this eye with a notch or precision lift, the sMap3D software has a “cut-out” tool to determine the fit without the area of the pinguecula being considered (Figure 2C). Here the simulated fluorescein pattern shows good limbal clearance with no edge lift and the actual fit of the virtually designed scleral lens with a toric haptic to rotationally stabilize the localized customized haptic (Precision) lift (Figure 3) was comfortable, well centered with good visual acuity.

CASE STUDY 3: PRECISION LIFT VAULT (& NOTCH OPTION) OVER PARALIMBAL CONJUNCTIVAL BLEB OS (PENETRATING KERATOPLASTY RESULTING IN CORNEAL IRREGULARITY)

Case 3 was a 64 year old female patient with a history of keratoconus and subsequent penetrating keratoplasty of her right eye as well as a previous trabeculectomy and recent glaucoma shunt surgery (Figure 1). Her best spectacle correction was only count fingers vision with a +4.00 -4.00 X 072. The sMap3D scleral elevation map (Figure 2A) identified the superotemporal filtering bleb elevation which was approximately 7mm wide and 2mm deep (assuming out to a diameter of 15.5-16mm). The “cut out” tool was utilized (Figure 2B) since inclusion of that area could adversely affect fit when a notch or a localized vault of the scleral lens is used to avoid this area.

DISCUSSION / CONCLUSION

The virtual fit without removing the bleb area recommended a base curve (BC) of approximately 34D in order to achieve 300μ of central clearance while it recommended a BC of 42D with the cut out tool. The scleral toricity value and BC with the use of the cut out tool were used to order lenses for this eye. Figure 3 shows the toricity plot at 16mm diameter showing the bleb at 120°. The size of the bleb as measured in Figure 2a (7mm x2mm) was used to order a notched lens (Figure 4) while this information plus bleb height data taken from Figure 3 was used to order a precision lift (microvault) lens (Figures 5A/5B & 6). Both lenses were successfully fit, equally comfortable with improved vision to 20/40. No fitting complications resulted from either design and both lenses were well stabilized with back-surface toricity. The patient currently wears the lens with the customized meridional lens vault.