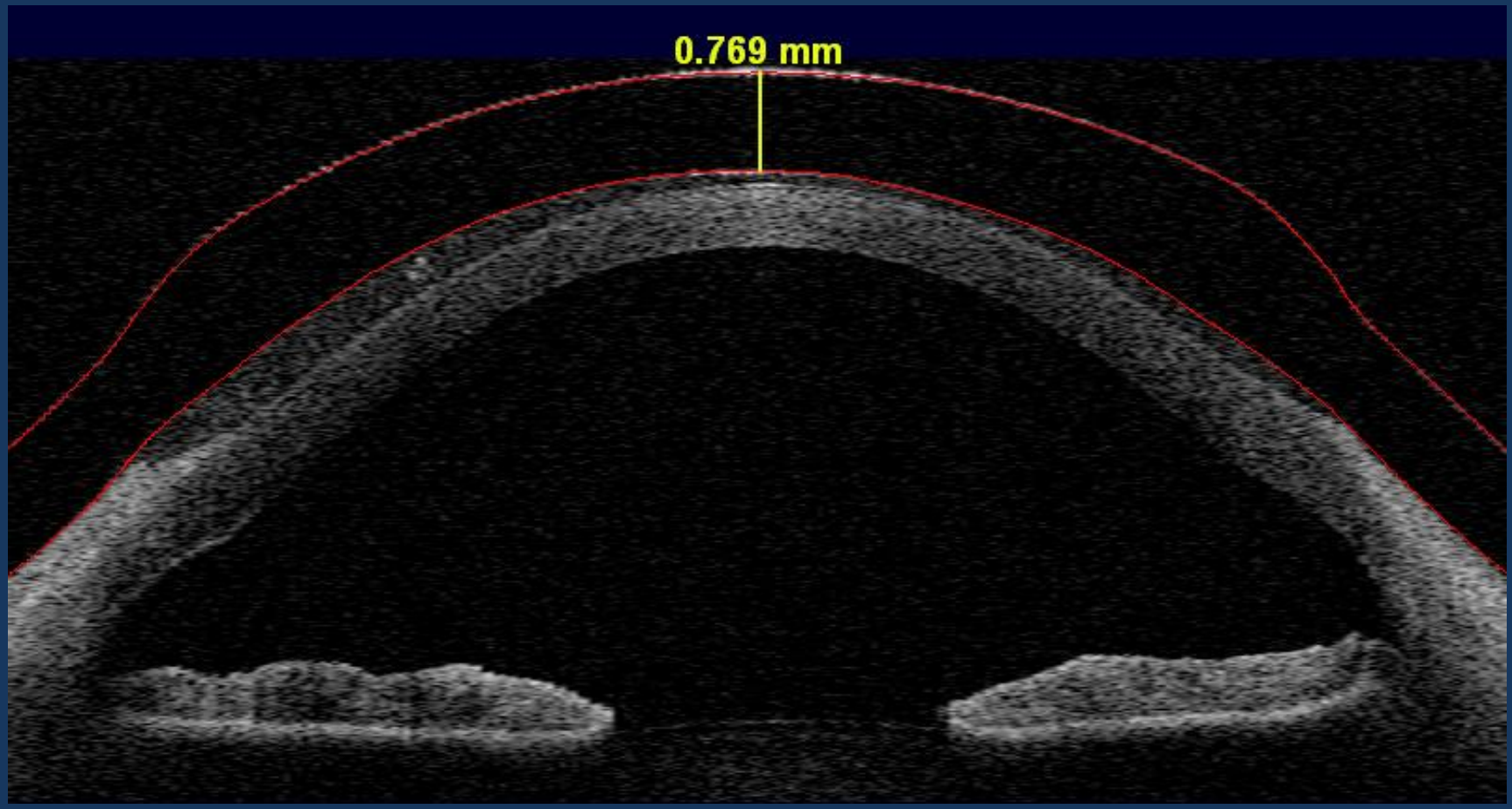
Flexure of Scleral Lenses

One of the most common problems of large lenses is flexure. When placed on a non-spherical eye, especially one with high astigmatism, the lens will bend. The common remedy for this is to make the lens thicker. Following is a recent series of images of a large scleral lens on an eye with advanced keratoconus. What is surprising – almost shocking, in fact – is how thick this lens is and it STILL FLEXES! I have seen this happen with all sorts of large lenses. In this case, the induced astigmatism resulted in a visual acuity of 20/60. With elimination of the astigmatism, the patient can see 20/30.

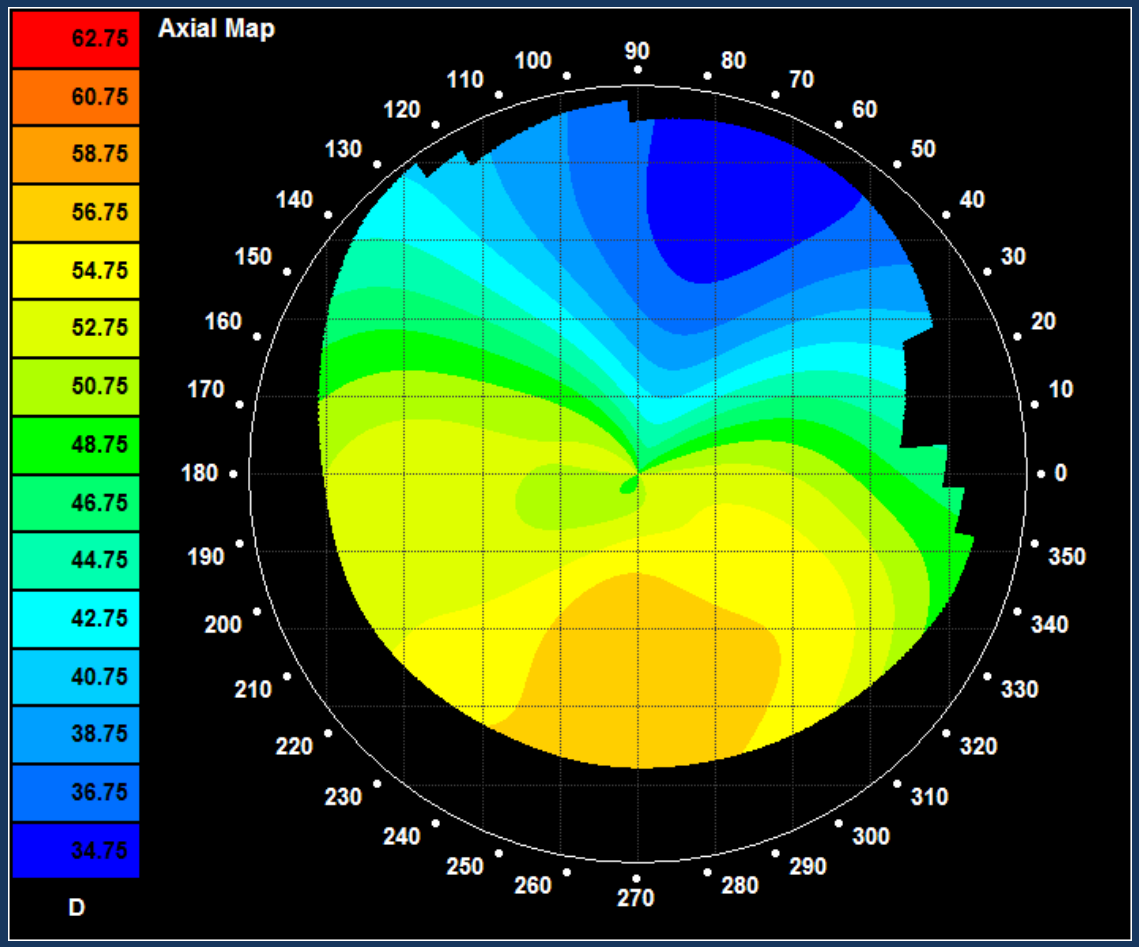
Thick Scleral Lens on Keratoconic Eye



Very thick scleral lens on a patient with keratoconus.

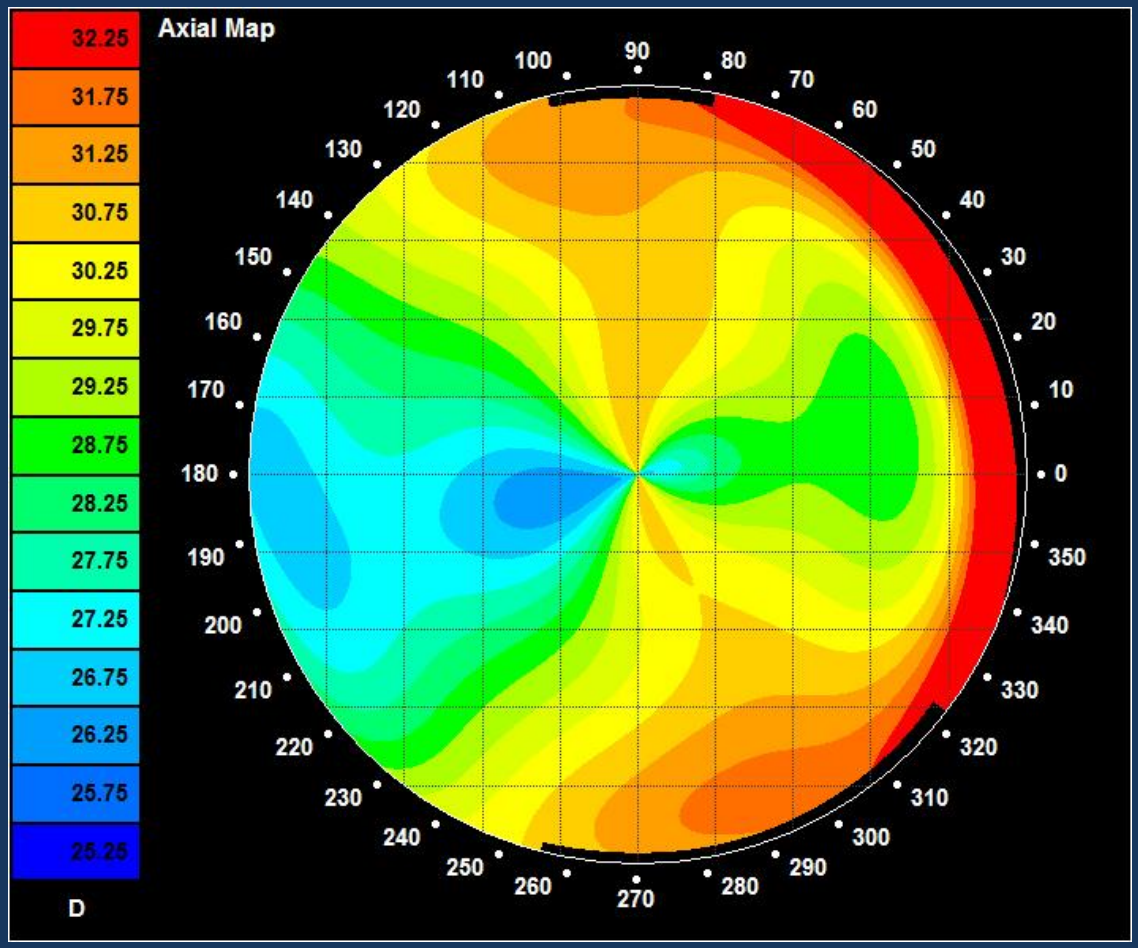
The lens is 20 mm in diameter and 769 microns thick at the center.

Corneal Topography



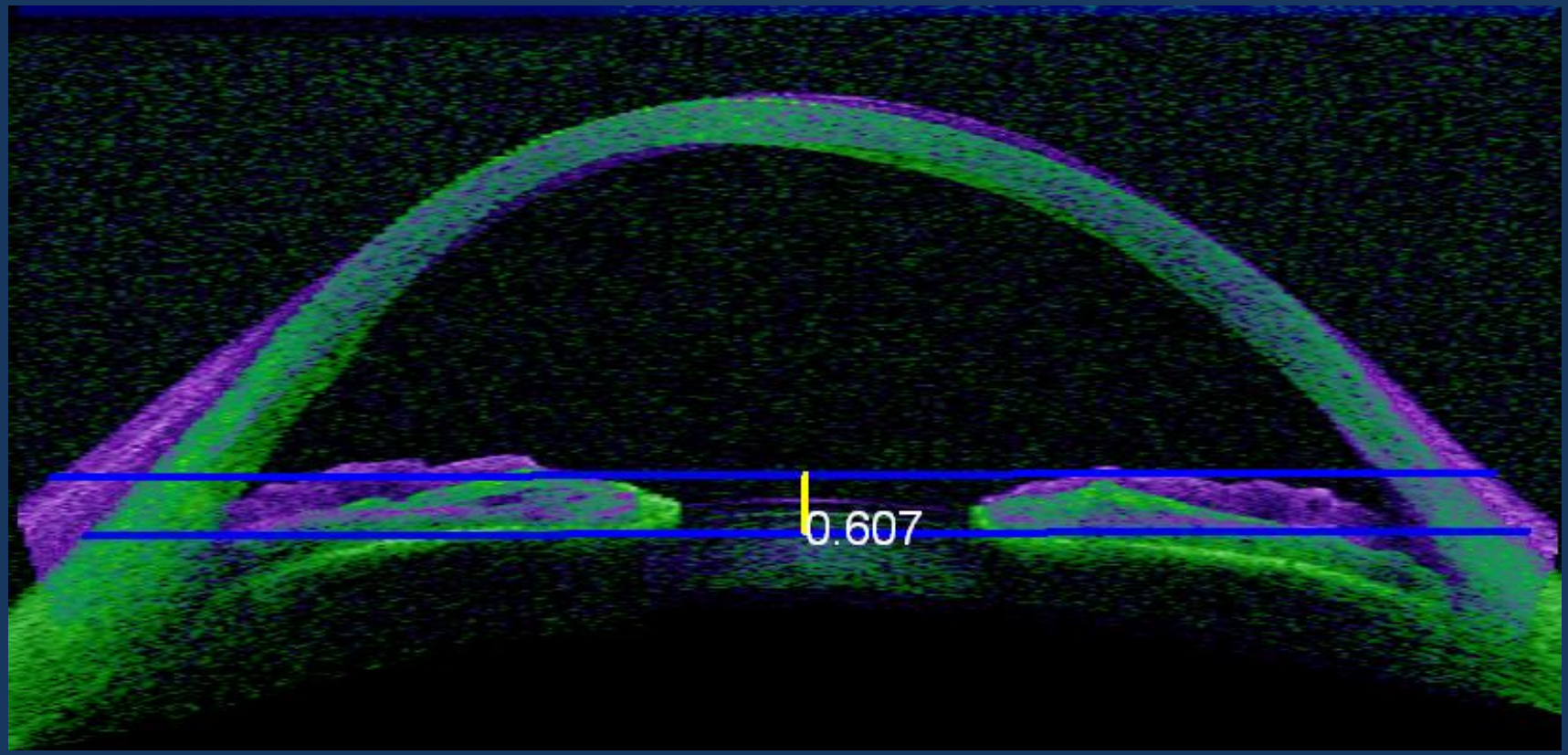
Corneal topography of this patient shows 12 D of astigmatism between the flatter and steeper sections of the cornea.

Topography Over Scleral Lens



Topography taken over the lens confirms the presence of more than 2 D of flexure. This translates to residual astigmatism and a reduction in the visual acuity by more than 2 lines Snellen.

OCT Images and Sags



This composite image shows the flatter (purple) meridian superimposed on the steeper (green) meridian. A 15 mm lens resting on the flatter meridian will show a difference gap of 607 microns at the periphery.

The Solution

We learned a number of years ago that induced or residual astigmatism was a problem with large GP lenses, including Macrolenses. Unfortunately, aside from making the lenses unacceptably thick, nobody was addressing the problem from a design point of view. In cooperation with Truform Optics and utilizing our patented Biometric design process, lenses can now be conformed to fit the highly toric or non-spherical eye, thereby reducing lens flexure and eliminating induced or residual astigmatism. We look forward to re-fitting this patient with a smaller, much thinner design resulting in improved visual acuity by 3 lines on the Snellen chart.