Of Base Curves and Adds

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Abstract:

In order to study the effective add power provided by the base curve in the Boston MultiVision RGP contact lens a standardized method of measurement was conducted. Measurements were made at predetermined distances from the optical center of each lens. The difference between the optical center spherical power and the peripheral lens power was used to determine the effective add power. The results suggest varying degrees of add power irrespective of base curve.

Introduction:

The Boston MultiVision RGP, manufactured in the daily wear BOSTON ES® material, is recommended for early presbyopes to provide clear vision at near, intermediate, and far distances (2 internet). Due to its unique back surface multiple aspheric design, Boston states that it provides add powers up to +1.50D (1). For this study, we measured the add distribution at predetermined distances from the geometric center of each lens ranging in base curve from 7.3 to 8.3 in 0.10mm increments. Throughout these measurements the power and diameter remained constant. We made comparisons of the base curve to add power relationship to determine whether there was a correlation.

Lens Parameters and Design- The Boston MultiVision RGP multifocal contact lens is composed of BOSTON ES® material (enflufocon A) using AERCOR ®

architecture. The properties of this material, according to Boston, provide a surface clear of deposits, long lasting characteristics, durability, comfort and a breathable lens with a DK of 36. This particular lens is available in base curves of 7.30 to 8.30 in 0.10mm increments. There is a fixed diameter and optic zone of 9.6 and 8.1mm respectively. It is available in powers ranging from –20.00 to +20.00D (1).

The lens has a spherical front surface with a multi-aspheric posterior curve design. It has an elliptical shape factor in the center, which forms a hyperbola moving toward the mid-periphery of the lens. As it continues, the mid-periphery itself contains a spherical fillet curve thus smoothing out the hyperbola, which results in an aspheric curve design for fitting purposes. Finally, the periphery ends in a hyperbola, which has greater eccentricity, resulting in a higher add (2). **(see diagram I)**

The Boston MultiVision lens, being a simultaneous design, is gaze-independent. However, it also utilizes translation to enhance plus power for near-point tasks. This is provided by the higher eccentricity created by the peripheral hyperbolic curve design.

Materials and Methods:

Intricate measuring devices were constructed through the use of six plastic contact lens cases. Holes were drilled through the wells of each case to create an aperture for measuring purposes. The **Xmm** holes were created as follows:

First case: in the center of the well.

Second case: two holes drilled, each a distance of 0.50mm from the well's center.

Third case: two holes drilled, each a distance of 0.75mm from the well's center.

Fourth case: two holes drilled, each a distance of 1.00mmfrom the well's center.

Fifth case: two holes drilled, each a distance of 1.25mm from the well's center.

Sixth case: two holes drilled, each a distance of 1.50mm from the well's center.

The convex side (backside) of the well acted as a support stand where the rigid lens was placed. The concave side of the well was then placed on the objective of the lensometer for measurement. Measurements were taken for each base curve starting at 7.3 and up to 8.3 in 0.10mm increments using each device with the above pre-determined apertures. Each measurement was taken twice and random lenses were selected for re-measurement.

Results: (refer to Table I)

As reflected in the graph total add powers range from 1.12D to 1.62D with no significant correlation found between the base curve and the overall effective add power distribution towards the periphery of each lens.

Discussion:

We agree the add power distribution "can" range up to +1.50D. However, this is subject to change with each lens, and is also patient dependent. For example different amounts of translation; varying fissure height; corneal topographical configurations, etc. may affect the total effective add power.

We found no consistency between the effective add power in regard to each 0.50mm of aperture separation.

Therefore one cannot state an absolute attainable add power of +1.50D.

Bibliography

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Table I

	Base Curve										
	7.30	**7.40**	**7.50**	**7.60**	**7.70**	**7.80**	**7.90**	**8.00**	**8.10**	**8.20**	**8.30**
Aperture Separation											
0.00mm	-3.12	-3.12	-3.12	-3.12	-2.87	-2.87	-3.00	-3.12	-3.00	-3.00	-3.00
1.00mm	-3.12	-3.12	-3.00	-3.00	-2.75	-2.75	-3.00	-2.87	-2.87	-3.00	-3.00
1.50mm	-3.00	-3.00	-2.75	-2.75	-2.75	-2.50	-2.50	-2.50	-2.62	-2.62	-2.75
2.00mm	-2.75	-2.50	-2.50	-2.75	-2.12	-2.12	-2.25	-2.12	-2.37	-2.50	-2.12
2.50mm	-2.25	-2.25	-2.25	-2.12	-1.75	-1.75	-2.25	-1.75	-1.87	-1.87	-1.87
3.00mm	-2.00	-2.00	-1.75	-1.75	-1.50	-1.25	-1.75	-1.50	-1.62	-1.50	-1.62
Effective Add at:											
0.50 from center	0.00	0.00	0.12	0.12	0.12	0.12	0.00	0.25	0.13	0.00	0.00
0.75 from center	0.12	0.12	0.25	0.25	0.00	0.25	0.50	0.37	0.25	0.38	0.25
1.00 from center	0.25	0.50	0.25	0.00	0.63	0.38	0.25	0.38	0.25	0.12	0.63
1.25 from center	0.50	0.25	0.25	0.63	0.37	0.37	0.00	0.37	0.50	0.63	0.25
1.50 from center	1.12	1.12	1.37	1.37	1.37	1.62	1.25	1.62	1.38	1.50	1.38