

**SPECIFIC GRAVITY AND VERTICAL LENS  
DECENTRATION**

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**ABSTRACT:**

The specific gravity of various rigid gas permeable (RGP) contact lens materials is often an overlooked parameter in RGP fitting and refitting. The purpose of this study was to evaluate the influence of specific gravity on the vertical positioning of two different RGP materials: Boston RXD (Polymer Technology Corp.) and Fluoroperm 60 (Paragon Optical, Inc.). Twenty subjects were fitted with one base curve of RXD material and similar base curve of FP 60 material on their right eyes. Vertical decentration was measured using a video biomicroscope. It was concluded that the Boston RXD lens decentered more inferiorly than the Fluoroperm 60 lens. Practitioners should consider specific gravity as an important parameter in the fitting of RGP lenses.

The specific gravity of various rigid gas permeable (RGP) contact lens materials is often an overlooked parameter in RGP fitting. The bulk of a RGP lens mass is primarily a function of the specific gravity, lens diameter and center thickness. When refitting a patient into a different RGP material with a lower specific gravity differential, less changes need to be made in lens design (diameter and center thickness). In other words, the higher the specific gravity differential, greater changes in lens design (diameter and center thickness) are required in refitting.

The purpose of this study was to evaluate the influence of specific gravity on the vertical positioning of two different RGP materials.

**METHODS**

Ten Boston RXD (Polymer Technology Corp.) and ten Fluoroperm 60 (Paragon Optical, Inc.) contact lenses were selected for this study. All twenty lenses were low minus (-3.00D), overall diameter 9.5mm, optic zone diameter 8.0mm, and had a measured center thickness of .15mm. The base curve radii of all twenty lenses were determined with the radiuscope.

Table 1 illustrates the base curve radii of the lenses used in the study. In order to eliminate observer variation, all lenses were verified by one investigator.

**TABLE 1: BASE CURVE RADII**

BOSTON RXD	FLUOROPERM 60
7.42	7.46
7.54	7.5
7.64	7.64
7.72	7.7
7.82	7.8
7.92	7.94
8.04	8.06
8.16	8.16
8.22	8.24
8.38	8.3

After all parameters were verified, each lens was dotted at its geometrical center in order to observe and measure vertical decentration. A Topcon biomicroscope with an attached video camera was used to measure the vertical positioning of the contact lenses on the subjects' eyes. The scaled measurements on a standard mm ruler were marked on a clear plastic transparency through the video biomicroscope at the lowest magnification setting (10X).

Twenty subjects were fit with one RXD lens and one FP 60 lens on their right eyes. In order to determine base curve selection, an average of three keratometry measurements was calculated by measuring corneal curvature of each subject's right eye by using a MARCO manual keratometer.

Table 2 illustrates the base curve selected for both the RXD and FP60 lenses. Each subject was fit according to the base curve criteria illustrated in Table 2 with one RXD lens and one FP60 lens. Vertical decentration of the lenses was determined by measuring the amount the lens dropped while each subject was viewed behind the video biomicroscope. The centered dot on each of the lenses was viewed against the scaled plastic transparency on the video monitor in order to measure vertical decentration in mm.

**TABLE 2: BOSTON RXD / FLUOROPERM 60 BASE CURVE SELECTION**

CORNEAL CYLINDER	BASE CURVE SELECTION
0.75D or less	0.50D flatter than K
1.00D to 1.75D	On K to 0.25 diopter flatter than K
>1.75D	0.25D steeper than K

To minimize tearing associated with any initial discomfort of the RGP lenses, one drop of 0.5% Proparacaine HCl was administered to the right eye of each subject prior to lens fitting.

## RESULTS

Illustrated in Table 3 is the complete study data for all 20 subjects. The mean value for the vertical decentration of the RXD lenses was calculated to be 1.98mm. The FP60 lenses had a mean vertical decentration of 1.45mm. These values were found to be statistically significant ( $p < .05$ ).

## DISCUSSION

The results of this study indicated that the vertical positioning of the Boston RXD material had a significant difference from that of the Fluoroperm 60 material. The RXD material vertically positioned more inferiorly on the eye compared to the FP60 material.

The Boston RXD (Polymer Technology Corp.) rigid gas permeable contact lens is manufactured using the material itabisfluorofacon A. The specific gravity of this lens is 1.27. The Fluoroperm 60 (Paragon Optical, Inc.) rigid gas permeable contact lens is manufactured using the material fluoro/silicone-acrylate. The specific gravity of this lens is 1.15.

The specific gravity of a material is defined as the ratio of the weight of a material in air to the weight of an equal volume of water in air at the same temperature. The results of this study illustrated that a RGP lens with a higher specific gravity vertically positioned more inferiorly than a RGP lens with a lower specific gravity value. Keeping all other lens parameters constant, the specific gravity value of different RGP materials does influence vertical positioning of lenses. Contact lens practitioners should consider the specific gravity of different RGP lenses as an important parameter in the fitting and refitting of RGP lenses.

**TABLE 3: VERTICAL DECENTRATION RESULTS**

SUBJECT	KERATOMETRY MEASUREMENT (D)	RXD BC (mm)	DECENTRATION (mm)	FP60 BC (mm)	DECENTRATION (mm)
1	45.50/46.00 @090	7.54	1	7.5	1
2	43.25/43.25	7.92	2.5	7.94	1.5
3	45.75/46.50 @180	7.42	2.5	7.46	1
4	42.75/43.00 @090	8.04	2	8.06	2
5	42.50/44.25 @070	7.92	1	7.94	0.5
6	43.00/43.25 @180	7.92	1.5	7.94	1
7	44.50/44.75 @090	7.64	2.5	7.64	1.5
8	45.00/46.25 @090	7.54	2.5	7.5	1.5
9	42.00/43.00 @090	8.04	2.5	8.06	2.5
10	42.50/43.50 @090	8.04	1.5	8.06	2
11	44.25/44.25	7.72	1	7.7	0.5
12	42.50/42.50	8.04	2	8.06	2
13	42.00/42.50 @090	8.16	1	8.16	1.5
14	46.00/46.75 @010	7.42	2.5	7.46	1.5
15	41.00/41.50 @090	8.38	1.5	8.3	1
16	44.75/46.00 @105	7.54	2	7.5	1
17	43.25/45.50 @080	7.72	3	7.7	2
18	45.00/46.25 @160	7.54	2	7.5	1.5
19	42.50/43.25 @090	8.04	1.5	8.06	1
20	44.00/44.50 @090	7.72	2.5	7.7	2.5

## REFERENCES

1. GHORMLEY, N.R. Specific Gravity Does It Contribute to RGP Lens Adherence. ICLC. 07/01/91. V.18 No.7 p125.
2. HILL, R.M. The Fluoroperms, 30 and 60. ICLC. 01/01/90. V.17 No.1 p46.
3. QUINN, T.G. The Influence of Specific Gravity on Vertical Positioning of RGP Lenses. ICLC. 11/01/89. V.16 No.11 p340.
4. TOMLINSON, A. RGP Decentralization problems. Contact Lens Forum. 07/01/90. V.15 No.7 p8.