

Comparison of Refractive Predictability Between Third and Fourth Generation Intraocular Lens Formulas used in the DMEK Triple Procedure

Christopher S. Sáles, MD, MPH^{1,2}; Zachary M. Mayko, MS²; Joshua Bockman, BS³; R. Wayne Bowman, MD⁴; Mark A. Terry, MD³; Michael D. Straiko, MD³
 1. Weill Cornell Medical College, New York, New York, USA | 2. Lions VisionGift, Portland, Oregon, USA | 3. Devers Eye Institute, Portland, Oregon, USA | 4. UT Southwestern, Dallas, Texas, USA

Layman Abstract

Descemet Membrane Endothelial Keratoplasty (DMEK) is the latest and most advanced iteration of endothelial keratoplasty, providing nearly anatomic replacement of the endothelial cells. **DMEK can achieve 20/20 vision with correction in a large proportion of eyes, which opens the possibility of providing uncorrected 20/20 vision when the surgery is performed in conjunction with cataract surgery because the crystalline lens of the eye can be replaced with a lens of the optimal power.** Decades of research and development have imparted cataract surgeons with 4 generations of intraocular lens (IOL) formulas to enable the best IOL power to be selected for a given eye of a given axial length. However, these formulas were developed for use in cataract surgery as a standalone procedure, not for use in DMEK surgery in conjunction with cataract surgery (i.e. the "Triple" procedure). **This study investigates how the formulas compare in predicting refractive outcomes for the eye.**

Purpose

To compare the refractive predictability of the SRK-T (ST), Hoffer-Q (HQ), Holladay 1 (H1), and Olsen (OS) lens formulas in the DMEK triple procedure in short, medium, and long eyes.

Methods

A retrospective review was conducted of a prospective consecutive series of DMEK triple cases performed at one center. Optical biometry was performed with the Lenstar. Standard cataract surgery with a one piece acrylic IOL was performed followed by DMEK surgery according to a published standardized technique: pre-stripped and S-stamped tissue provided by an eye bank, overstripping of the recipient, modified glass Jones tube, no-touch tap technique, and 20% SF6 gas bubble. Manifest refraction was measured at 6-months. The difference between the achieved spherical equivalent (SE) and the predicted SE was compared between the HQ, ST, H1, and OS formulas. Eyes were grouped by axial length (short: <22 mm; medium: 22-26 mm; and long: >26 mm).

Results

60 consecutive eyes were included in the study. Among eyes < 22 mm (n=4), the mean differences between the predicted...

Table 1. Demographics & Refractive Parameters

| Parameter | Value |
|--|-------------|
| Mean Age | 63.9 years |
| PreOp Mean BSCVA | 0.20 logMAR |
| PreOp Mean SE | -0.04 D |
| PreOp Median Anterior K | 43.51 D |
| PreOp Median Axial Length | 23.74 mm |
| PostOp Mean BSCVA at 6-months | 0.06 logMAR |
| PostOp Mean SE at 6-months | -0.48 D |
| Percent SE within 0.5 D of 0.0 at 6-months | 38% |
| Percent SE within 1.0 D of 0.0 at 6-months | 72% |

Figure 1. Mean Difference

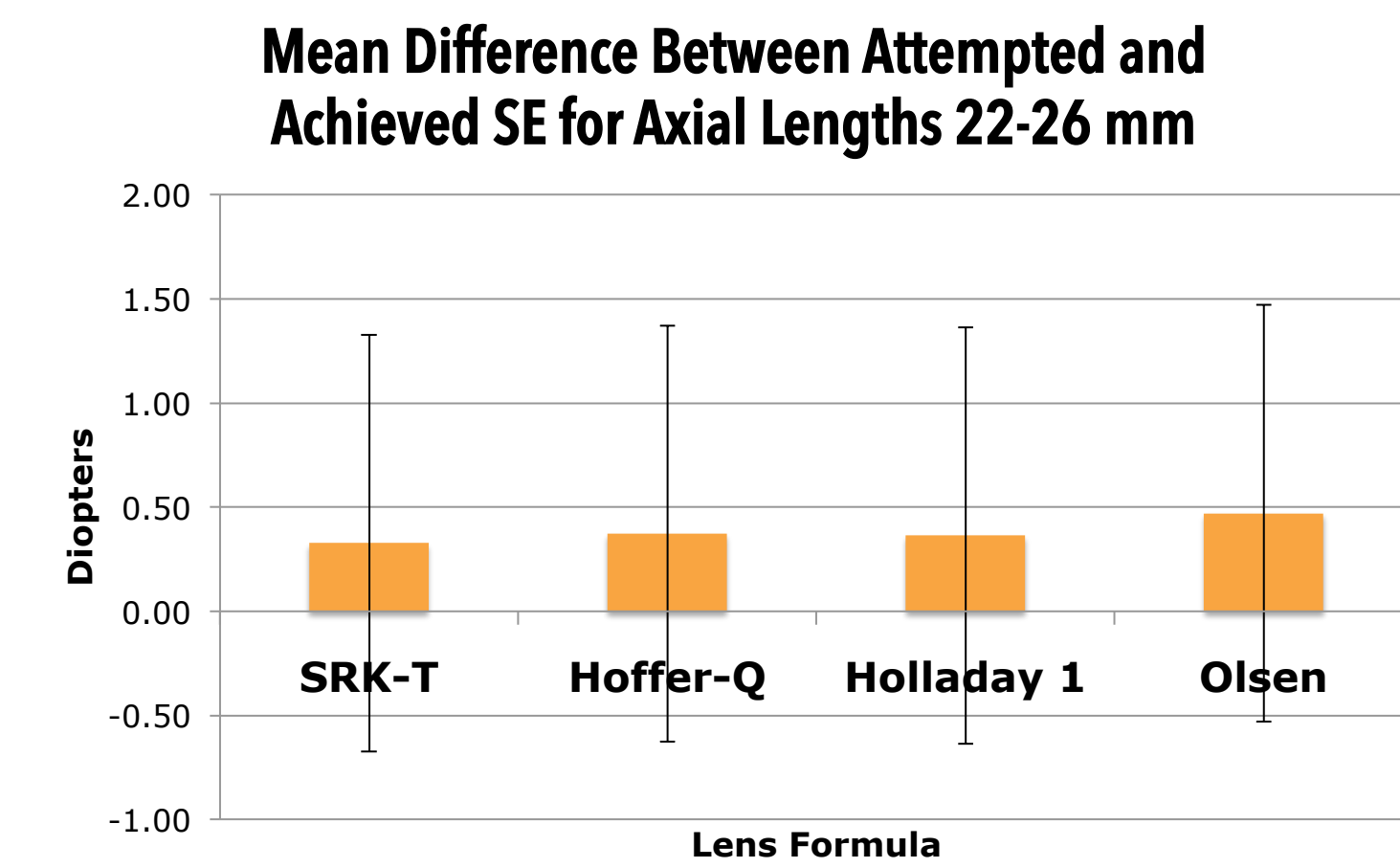
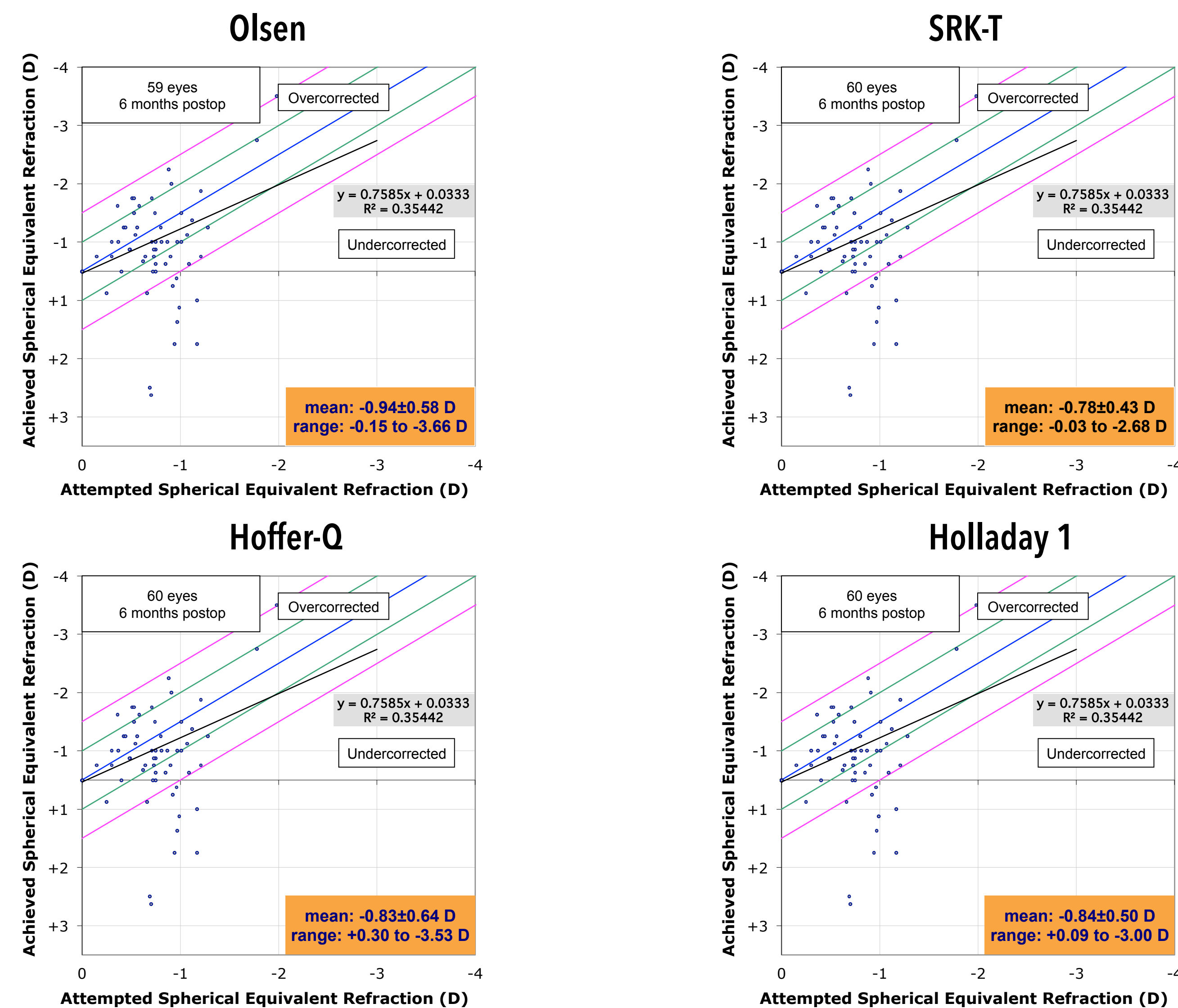


Figure 2. Scatter Plot of Predicted vs. Achieved 6-month SE Outcomes



Results (Continued)

...and achieved SE for the ST, HQ, H1, and OS formulas were -0.19 D, -0.43 D, -0.19 D, and 0.13 D, respectively. Among eyes 22-26 mm (n=53), the mean differences were 0.33 D, 0.37 D, 0.36 D, and 0.47 D, respectively. Among eyes > 26 mm (n=3), the mean differences were 0.07 D, 0.54 D, 0.44 D, and 0.17 D, respectively. In the 22-26 mm subgroup, the ST had a smaller difference compared to the H1 (p=0.03) but exhibited equivalence compared to the HQ (p=0.75) and OS (p=0.37).

Conclusions

In eyes undergoing the DMEK triple, the SRK-T, Hoffer-Q, Holladay 1, and Olsen formulas may exhibit different gradations of predictability. If this postulate is confirmed in a larger study, it may be possible to refine the intraocular lens target (at this center it is -0.7 D to achieve emmetropia) according to the formula used by the surgeon.

References

1. Schoenberg ED, Price FW Jr, Miller J, McKee Y, Price MO. Refractive outcomes of Descemet membrane endothelial keratoplasty triple procedures (combined with cataract surgery). JCRS 2015; 41: 1182-9.

Financial Interest Disclosure

CSS - None; ZMM - None; JB - None; RWB - None; MAT - None; MDS - None.