A comparison of refractive error in post-operative RK and PRK patients

Jenna Fukushima
Pacific University

Kayla Miller
Pacific University

Amy Mitzel
Pacific University

Cheryl Torghele
Pacific University

Recommended Citation
Fukushima, Jenna; Miller, Kayla; Mitzel, Amy; and Torghele, Cheryl, "A comparison of refractive error in post-operative RK and PRK patients" (1997). College of Optometry. 1234.
https://commons.pacificu.edu/opt/1234

This Thesis is brought to you for free and open access by the Theses, Dissertations and Capstone Projects at CommonKnowledge. It has been accepted for inclusion in College of Optometry by an authorized administrator of CommonKnowledge. For more information, please contact CommonKnowledge@pacificu.edu.
A comparison of refractive error in post-operative RK and PRK patients

Abstract
Approximately 25% of the world's population are myopic. In the United States Radial Keratotomy (RK) and Photo Refractive Keratectomy (PRK) have emerged as the two most common refractive surgery procedures for the correction of myopia. These two surgeries were the focus of this study. The success rates of both RK and PRK were compared based solely on the resultant uncorrected visual acuity one year following surgery. The subjects included in this study consisted of 38 post-RK patients (50 eyes) and 44 post-PRK patients (50 eyes). Subjects had less than 8.75D of myopia and less than 1.50D of corneal astigmatism. The patients were randomly age and refractive error matched and the results analyzed using a two-tailed test. The results of this study found that patients who underwent PRK had statistically significant better one year post-operative uncorrected visual acuity's. Fifty percent of the PRK subjects had unaided acuity of 20/20 or better, while 26% of the RK subjects had unaided acuity of 20/20 or better.

Degree Type
Thesis

Rights
Terms of use for work posted in CommonKnowledge.

This thesis is available at CommonKnowledge: https://commons.pacificu.edu/opt/1234
Copyright and terms of use

If you have downloaded this document directly from the web or from CommonKnowledge, see the “Rights” section on the previous page for the terms of use.

If you have received this document through an interlibrary loan/document delivery service, the following terms of use apply:

Copyright in this work is held by the author(s). You may download or print any portion of this document for personal use only, or for any use that is allowed by fair use (Title 17, §107 U.S.C.). Except for personal or fair use, you or your borrowing library may not reproduce, remix, republish, post, transmit, or distribute this document, or any portion thereof, without the permission of the copyright owner. [Note: If this document is licensed under a Creative Commons license (see “Rights” on the previous page) which allows broader usage rights, your use is governed by the terms of that license.]

Inquiries regarding further use of these materials should be addressed to: CommonKnowledge Rights, Pacific University Library, 2043 College Way, Forest Grove, OR 97116, (503) 352-7209. Email inquiries may be directed to: copyright@pacificu.edu

This thesis is available at CommonKnowledge: https://commons.pacificu.edu/opt/1234
A COMPARISON OF REFRACTIVE ERROR IN
POST-OPERATIVE RK AND PRK PATIENTS.

By

JENNA FUKUSHIMA
KAYLA MILLER
AMY MITZEL
CHERYL TORGHELE

A thesis submitted to the faculty of the
College of Optometry
Pacific University
Forest Grove, Oregon
for the degree of
Doctor of Optometry
November, 1997

Advisors:

Pat Caroline, C.O.T., F.A.A.O.
Karl Citek, O.D.
About the Authors

**Jenna Fukushima** grew up in Grande Prairie, a small city in Northern Alberta. Upon completion of high school, she went on to attend the University of Victoria in British Columbia. Following three years of studies in biology, she was accepted at Pacific University's College of Optometry in 1994. She received her Bachelor's degree in Visual Science from Pacific University in 1996, and graduates from Optometry school in May 1998. She has plans to travel abroad before beginning her Optometric career back on Vancouver Island.

**Kayla Miller** is from Dalton, a very small town in central Minnesota. She attended Fergus Falls Community College and received an Associate in Arts Degree. She then studied biology for two years at the University of North Dakota at Grand Forks. She attained her Bachelor's in Science from Pacific University in 1996, and plans on graduating with a doctorate in Optometry in May of 1998. She is hoping to return to the Midwest and practice primary care optometry, with an emphasis in contact lens.

**Amy Mitzel DuBois** was born and raised in Valley City, ND. She attended grade school, high school and three years of undergraduate in Valley City before moving to Oregon in August of 1994. She received her Bachelor of Science from Pacific University, Forest Grove, OR, and went on to attend Pacific University College of Optometry. She was married in August of 1997 and cannot wait to return to North Dakota to join her husband upon graduating optometry school in May of 1998. She plans to join a group practice of two other optometrists and practice primary care optometry in ND.

**Cheryl Torghele** grew up in Ogden, Utah. She received a Bachelors of Science in Biology with a minor in Chemistry from the University of Utah in 1994. She is a faithful "running Ute" basketball fan. Her next move in life was to Forest Grove (actually Cornelius) to attend Optometry school at Pacific University. She has plans to graduate in May of 1998 and move back to Salt Lake City, Utah to work in a setting which would allow her to practice primary care Optometry.
RK VS. PRK THESIS

ABSTRACT
Approximately 25% of the world's population are myopic. In the United States, Radial Keratotomy (RK) and Photo Refractive Keratectomy (PRK) have emerged as the two most common refractive surgery procedures for the correction of myopia. These two surgeries were the focus of this study.

The success rates of both RK and PRK were compared based solely on the resultant uncorrected visual acuity one year following surgery. The subjects included in this study consisted of 38 post-RK patients (50 eyes) and 44 post-PRK patients (50 eyes). Subjects had less than 8.75D of myopia and less than 1.50D of corneal astigmatism. The patients were randomly age and refractive error matched and the results analyzed using a two-tailed test.

The results of this study found that patients who underwent PRK had statistically significant better one year post-operative uncorrected visual acuity's. Fifty percent of the PRK subjects had unaided acuity of 20/20 or better, while 26% of the RK subjects had unaided acuity of 20/20 or better.
Acknowledgements

The authors would like to acknowledge

* Patrick Caroline C.O.T., F.A.A.O. for all his time, data compiling, editing and effort to complete this project.

* Carl Citek O.D., F.A.A.O. for his time and help in analyzing and reviewing the statistical results.

*Ophthalmologists at the Oregon Health Science University for enabling us access to their surgical results.
INTRODUCTION

Patient interest in refractive corneal surgery procedures is on the rise. To date, Radial Keratotomy (RK) and Photo Refractive Keratectomy (PRK) have evolved into the most popular means of surgically decreasing myopia. A number of factors have been cited with regard to patients pursuing refractive surgery. These include: the desire to decrease dependency on spectacle or contact lens correction, contact lens intolerance, sports or hobby requirements, cosmetic concerns, and occupational visual requirements21,24,26.

Radial Keratotomy, Historical Perspective

A form of Radial Keratotomy was first performed in 1953 in Japan by Tutomu Sato15,20,21. Sato himself called the operation "posterior half-incision" of the cornea. The procedure consisted of using handheld knives wherein incisions were made in the anterior and posterior surface of the cornea15,20,22.

In 1973 the Russian ophthalmologist Svatyslav N. Fyodorov began performing partial corneal penetration Radial Keratomy. At that time, he made a number of important modifications to the surgical procedure of Sato, which included: varying the size of the optical zone from 2.0 to 6.0 mm depending upon the degree of myopia, performing incisions on the anterior surface of the cornea--thus minimizing the possibility of damaging the delicate endothelium, determining incision depth on actual measurements of corneal thickness using optical pachymetry, using ultra-sharp disposable razor fragments to make the incisions, limiting the incisions to 32 made from the limbus, converging upon a pre-marked optical zone, and Fyodorov used a microscope with all its advantages in performing micro surgery15.

The first RK surgery in the United States was performed by Leo Bores, M.D., in 197815,18,20.

Radial Keratotomy Surgical Technique
Today, RK surgery consists of four to eight radial incisions extending approximately 95% of the depth of the cornea\textsuperscript{18,20}. Early in its evolution, the radial incisions were made with carbon steel razor fragments. However, in 1982, calibrated and guarded diamond blades were introduced. These significantly reduced the inter-operative and post-operative complications\textsuperscript{19,23}.

The Prospective Evaluation of Radial Keratotomy (PERK) was the first attempt to standardize the procedure in the United States\textsuperscript{19,21,23}. PERK standard protocol for the surgery included:

* Corneal Anesthesia
  Anesthesia with 0.5% proparacaine\textsuperscript{23}.

* Making of the Visual Axis
  Corneal reflection of the operating microscope used to estimate the position of the visual axis. The surgeon must make a correction for the angular separation between the microscope light source and the axis of observation. An initial mark is made with a hypodermic needle in the corneal epithelium just below the reflection of the microscope light filament\textsuperscript{23}.

* Making of the Optical Zone
  An optical zone trephine used to make the clear unoperated central zone. This can vary in diameter from 3.0 to 6.5 mm. The trephine marks represent the limit to which the epithelial cuts will come toward the visual axis\textsuperscript{23}. An ultrasonic pachometer is then used to measure corneal thickness. Readings for corneal thickness are taken centrally and at 3, 6, 9, and 12 o'clock meridians outside the circular trephine mark\textsuperscript{23}.

* Incision
  Four to 8 free hand incisions are then made equidistant around the cornea using a diamond blade\textsuperscript{23}. Initiating the incisions requires the knife to be held perpendicular to the cornea, introducing the blade into the stroma next to the trephine mark. The foot plate of the knife slightly indents the epithelium surface stopping further penetration of the knife\textsuperscript{23}.
The blade is pulled toward the limbus in a smooth single line. At the same time, mild pressure is used on the globe with fixation forceps. The globe is grabbed and pulled away from the incision. Incision marks made from the trephine mark to the limbus arcades. After all incisions are made, each wound is irrigated with a balanced salt solution.

*Post-Surgical Medications*
A 0.3% gentamicin solution and a cycloplegic drug are administered.

The incisions weaken the paracentral and peripheral cornea, which move anteriorly under the influence of intraocular pressure, causing a compensatory posterior movement and flattening of the central cornea. This reduces the corneal refractive power and decreases the myopia.

**Photorefractive Keratectomy, Historical Perspective**

In 1977, potential medical and industrial applications of new lasers were the subject of a meeting at the Optical Society of America. By 1978, in Gottingen, Germany, Tachisto and Physik were marketing excimer lasers for laboratory use. The first ocular experimentation with the excimer laser was performed on animals in 1981 by Steve Trokel and colleagues. They achieved a precise linear ablation of bovine (veal) cornea with 193 nm radiation. The first PRK in the United States was performed by McDonald in 1988. The procedure received FDA approval in October of 1995 for correction of myopia from -1.00D to -6.00D.

Photoablation, a term used to describe the effect of the high energy produced by the excimer laser in the targeted areas. The excited photon of energy leaving the laser resonating cavity is directed upon certain areas of the cornea.

The procedure consists of debriding 7.0 mm of the central corneal epithelium mechanically or with the laser and ablating a new contour...
to the anterior corneal stroma with a 193 nm Argon Fluoride excimer laser. The procedure delivers a laser beam through a template such as a slit or mask which produces equal distribution of the laser energy to a given area. Following re-epithelialization, the decreased optical power of the central ablated zone of the cornea reduces myopia.

Photorefractive Keratectomy Surgical Technique

The procedure of Photorefractive Keratectomy consists of many steps, these include:

* Anesthetize the cornea using topical proparacaine.
* Patients eyes are viewed binocularly with the optical microscope and aligned with the laser beam axis.
* The patients eye must remain immobile and steady throughout the procedure. A vacuum eye fixation device such as a Thorton type ring, or even forceps can be used to accomplish fixation.
* Once stabilized, a Number 57 "hockey stick" Beaver blade is used to debride the epithelial area to 1 mm outside the proposed impact area. Once all of the fragments of epithelium have been removed from Bowman's layer, the eye is aligned along the laser beam axis and the surgeon again views the eye through the cross-hair reticle.
* It is important that during the procedure, the ablative tissue effluent is removed and hydration of the cornea is maintained. If not, the ablated tissue will block the underlying tissue from the incoming UV light.
* The excimer laser uses extremely short pulses at a rate of 12 to 15 ns. Each one of the pulses can remove 0.1-0.5 μm of corneal tissue. A rectangular block of tissue is removed by the laser.
* As the amount of myopia to be corrected increases, so does the need for corresponding increase in depth and diameter of the excised tissue.
*When the ablative depth has been reached, a balance salt solution is placed on the ablated area\textsuperscript{15}.
*A prophylactic erythromycin ointment is placed in the cul de sac\textsuperscript{15}.
*A protective eye pad is placed over the eye and the patient is instructed to return to the clinic for a scheduled follow-up visits\textsuperscript{15}.

**Candidates for Photorefractive Keratectomy and Radial Keratotomy**

Candidates for PRK and RK must be at least 18 years of age with a relatively stable refractive history during the past year to prevent progressive refractive changes \textsuperscript{26}. Ideal patients should have a refractive status of 1.00 to 6.00D of myopia with less than 1.00D of cylinder \textsuperscript{25}. In addition, a slit-lamp examination of a refractive surgery candidate should show an essentially normal cornea\textsuperscript{23}. Candidates must be educated on RK and PRK potential side effects and the post-operative healing period of both.

**Contraindications for Refractive Corneal Surgery**

Contraindications for PRK and RK include patients with progressive myopia, keratoconus or suspects, patients with corneal disorders, or diffuse vascularization of the cornea. Other contraindications for RK and PRK include uveitis, cataracts, retinopathies, active external infection, and lagophthalmos\textsuperscript{24,21}. Patients with systemic connective tissue diseases, history of herpes simplex keratitis, irregular astigmatism, depressed corneal scars, history of keloid formation, diabetes mellitus, or pregnancy are possibly contraindicated for these procedures \textsuperscript{23}. Patients with pupils exceeding six millimeters should be excluded from these procedures or at least forewarned about the possibility of glare with night driving \textsuperscript{25,22}.

**Radial Keratotomy vs. Photorefractive Keratectomy**
Many patients question which refractive surgery procedure is best suited for their age and refractive error. Other patient concerns include cost, time involved, side effects, complications, and, most importantly, resultant uncorrected visual acuity\textsuperscript{24,26}. Eye care professionals must strive to stay abreast on the ever changing technologies of this field; in order to provide the patient with as much information as possible to allow them to make a more informed decision.

To date, RK is the most common refractive surgery in the United States. In 1993 alone, 250,000 procedures were performed and techniques are improving\textsuperscript{23}. However, advancements in PRK in the last few years have led to the hypothesis of this study. The hypothesis for this study predicts an outcome wherein PRK proves more successful than RK for unaided visual acuities.

**METHODS**

Ophthalmologists at The Casey Eye Institute in Portland, Oregon have performed approximately 300 RK and 1,000 PRK procedures. All PRK procedures have been performed with the Nidek EC-5000 or the Summit SVS-Apex laser. All the RK and PRK procedures were performed by the same two surgeons Larry Rich M.D. and Scott MacRae M.D. The RK procedures were performed from 7/82 to 6/95 and the PRK procedures between 12/94 to 12/96.

Fifty eyes of 32 post-RK patients and 50 eyes of 44 post-PRK patients were randomly chosen from files of the Refractive Surgery Center at the Casey Eye Institute in Portland, Oregon. All patients had pre-operative refractive errors between -1.00 D and -8.75 D and were correctable to within one line of 20/20 Snellen visual acuity pre-operatively. Only patients who did not have enhancement procedures within one year of the surgery were included. One RK patient was a mild ambyope who did achieve a final best corrected visual acuity equal to the pre-operative best corrected acuity. Also,
one RK subject experienced a corneal perforation but likewise achieved a best corrected visual acuity within one line of pre-operative measure.

A retrospective review of patient charts was performed and the following information gathered: patient's age at the time of surgery, gender, pre-operative unaided acuity, refractive error, and best corrected visual acuity, date of surgery, post-operative unaided acuity, refractive error one year from the date of surgery, and best corrected visual acuity.[See Appendix I]

RK and PRK patients were paired for analysis. Each pair consisted of one RK subject and one PRK subject of the same age (within one year) and of the same pre-surgical refractive error (within a spherical equivalent of 0.50D).

Visual acuity's were originally measured with a Snellen chart at 20 feet. For analysis purposes we converted these values into log minimum angle of resolution (logMar) units using:

$$\text{logMAR} = +\log \left( \frac{1}{\text{Snellen VA}} \right)$$

Compared to Snellen acuities, the logarithmic scale allows for a more correct analysis of the data. The visual acuity results were re-converted to Snellen units.

RESULTS
Table one shows the similarities of pre-operative refractive error and age for the paired groups used in this study.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>RK Preop RE</td>
<td>-4.00 D</td>
<td>1.70 D</td>
</tr>
<tr>
<td>PRK Preop RE</td>
<td>-4.00 D</td>
<td>1.50 D</td>
</tr>
<tr>
<td>RK Age</td>
<td>39.76 years</td>
<td>8.46 years</td>
</tr>
</tbody>
</table>
Although gender was not matched in the pairs, the distributions are virtually equal among the two groups. The PRK group contains 21 females and 29 males, while the RK group contains 20 females and 30 males.

The post-operative visual acuity's of the two groups were statistically different when evaluated with a two-tailed \( t \)-test, \( t(49) = -4.202, p = .0001 \). The mean post-operative, uncorrected, logMAR and Snellen visual acuity's for PRK and RK are listed in Table 2.

<table>
<thead>
<tr>
<th></th>
<th>Mean logMAR Acuity</th>
<th>S.D.</th>
<th>Mean Snellen Acuity</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RK</td>
<td>0.334</td>
<td>0.408</td>
<td>20/40-20/50</td>
<td>four lines</td>
</tr>
<tr>
<td>PRK</td>
<td>0.080</td>
<td>0.125</td>
<td>20/20-20/25</td>
<td>one line</td>
</tr>
</tbody>
</table>
Figure 1: The frequency of post-operative logMAR visual acuity for RK and PRK patients.

The interval of uncorrected, post-operative Snellen acuity's in the PRK group ranged from 20/15 to 20/40. The interval of uncorrected, post-operative Snellen acuity's in the RK group ranged from 20/20 to 20/400 (Figure 1). Of the PRK subjects, 50% had unaided acuity's of 20/20 or better. One hundred percent of the PRK subjects had unaided acuity's of 20/40 or better. Of the RK subjects, 26% had unaided acuity's of 20/20 or better, and 78% had 20/40 or better.

The mean post-operative, uncorrected refractive error in the PRK group is -0.25 D with a standard deviation of +/-0.50 D. The RK mean is -1.00 D with a standard deviation of +/-1.25 D. The refractive errors of the two groups were statistically different when evaluated with a two-tailed t-test, t(49)= 4.157, p=.0001.
DISCUSSION

These results show a significant difference in uncorrected visual acuity outcomes between the two procedures of RK and PRK. It must be re-emphasized that all patients began at the same starting points, being of similar age, and having similar pre-operative refractive errors and pre-operative visual acuity. These factors make the subjects directly comparable.

From a general review of several previous outcome studies on RK, it is evident that RK results are quite varied. Patients resulting with post-operative acuity of 20/40 or better range from 69% to 88%7. This study, with a finding of 78% comes well within that range. It has also been concluded in another large study that only 53% of RK patients achieved "perfect vision"3. Assuming this means 20/20 visual acuity, our study findings of only 26% are largely different.

According to early PRK studies by Summit, 98.8% of patients achieved a visual acuity of 20/40 or better, which compares well with this study's findings of 100%. In the same Summit study, 80.5% achieved acuity's of 20/20 or better 1 year post-operative while in this study only 50% achieved acuity's of 20/20 or better1,6. These surgeries all involved 6.0 mm ablations and refractive errors of -1 to -6.00 D. Studies which include myopes of up to -7.00 D, which would compare more closely to this study show 91% patients achieving 20/40 or better. Results from numerous other PRK studies are very consistent with the statistics stated above6,11.

It must also be mentioned that in the same study performed by Summit, 1% actually lost 2 lines of best corrected visual acuity. In this study none of the patients experienced a loss of best corrected visual acuity4.

The results of this study should be viewed in light of a number of factors which are addressed below.

Overcorrection
Thus far in its history, the RK technique has resulted in a hyperopic shift of 1.00D or greater in approximately 30% of patients\textsuperscript{7}. This can occur up to 5 years after the surgery. Some surgeons, in fact, aim to undercorrect the patient, leaving them slightly myopic to compensate for this phenomenon\textsuperscript{12,18,23}. Surgeons in this study did not intentionally undercorrect since it cannot be determined which patients will react in this manner.

Therefore, the mean post operative refractive error of -1.00D found in this study cannot be attributed to this. This does not mean, however, that in time, the RK patients in this study may relapse to less myopia. The VA's for the RK patients could possibly improve.

To date there has been no significant report of a trend towards hyperopia in patients following PRK. This studies results of -0.25D post operative refractive error support this.

\textit{Variation in Surgeons Results}

The success of these surgeries, primarily RK, are heavily reliant on the level of skill and precision of the surgeon. The main factor that induces variability in the RK results is dependent on the aggressiveness of each surgeon in suggesting additional enhancement procedures\textsuperscript{12}. Many surgeons feel that RK is not a single surgical procedure but instead a series of two or more procedures designed to accommodate the individual's response to the previous procedure.

Surgeon's skill is of less relevance to the outcome of the PRK procedure, however experience at doing it is what matters. These surgeons have performed over 1,000 PRK procedures to date.

The fact that the same two ophthalmologists performed all of the PRK and RK procedures and have been performing these surgeries for 15 years makes this data more reliable, in comparison to other studies which pool data from a variety of surgeons.
Surgical Technique

The technique for performing the Radial Keratotomy procedure varies among surgeons. The type and thickness of the blade, the optical zone diameter, the length and depth of the incision, the direction of the incision, control of intra-ocular pressure and very importantly, the number of incisions made are some examples of the inter-operative variables \(7,12,23,24\). All of these factors have a direct influence upon the resultant visual acuity's of the patients.

It is now well supported amongst refractive surgeons that four incision procedures produce the best resultant visual acuity and the least amount of over correction\(^12\). Surgeons at the Casey Eye Institute made four incisions on all RK surgeries. The optical zone was varied from 3.0 - 6.0 mm depending on the patients age and refractive error.

The primary surgical variables with the PRK procedure involve the ablation zone diameter, method of epithelial debridement, centration of the ablation zone, and the type of fixation used\(^14\).

Surgeons at Casey removed the epithelium mechanically, with a #64 Beaver blade, after instillation of topical anesthetics and prophylactic antibiotics. The standard ablation zone diameter of 6 mm was used. Proper alignment of the patients optical axis with the laser beam was specific to the Nidek EC 5000, the brand of laser used for all PRK patients in this study. It was accomplished by maneuvering a console of levers which shift the operating scope and the laser\(^11,14\). This type of laser uses a scanning delivery system.

Diurnal Fluctuations in Visual Acuity

According to a number of studies, the visual acuity in post RK patients may change greatly (2-7 lines of VA loss) throughout the day. These fluctuations have been documented to persist even up to
11 years post-operatively. This is a variable factor in this study, because the time of day the visual acuity's were recorded was not noted.

Diurnal changes have not been documented to occur with PRK patients.

Patient Compliance and Follow-up

Patient compliance regarding post operative care and follow up is also an influential factor on the success of the surgical procedure. There is a specific regimen of topical medications and patching which require frequent visits with the practitioner to monitor the rate of corneal healing, infections and the prevention of regression of the refractive error. If the patient is negligent or uninformed on proper follow up protocol, he may have a far worse looking cornea, with possible scarring, edema or infiltrates of some kind that may effect the 1 year post-operative acuity.

Specific protocol for post RK surgeries in this study included a prophylactic antibiotic bid-qid for 5-7 days. If a corneal perforation occurred during surgery, the eye must be flushed for 2-3 minutes with these immediately following the procedure. Use of topical steroids is controversial amongst specialists. Casey Eye surgeons did not. Pain is reportedly severe for the first 24-48 hours after surgery. Oral analgesics (usually schedule 2 narcotics) q4h, and a sedative are commonly prescribed.

Post-operative treatment for PRK patients is just as imperative in the overall success of the surgery. It can, for some patients, last up to a year, provided no major complications arise. Immediately following surgery, non-steroidal anti-inflammatory's, q.i.d, for 24 - 48 hrs are used, then tapered to b.i.d. for another 24 hrs. In addition, an antibiotic/steroid combo is used, q.i.d., until the epithelium heals. Once this has occurred, and the epithelium is completely healed, this drop is discontinued and replaced with flurometholone 0.1% drops,
q.i.d. for at least a month. From here it is tapered as needed. Visits occur daily until the epithelium has healed, then at 2 weeks, followed by monthly checks for 6 months2,4,5,9,10,11.

Not all corneas respond the same to refractive surgery procedures. Recent studies of patients who had PRK have discovered 3 general response categories to the surgery. A brief description is outlined below:

Type 1: 95% of all patients.
1 month post-op: Trace to no haze and RE of Hyperopia from PI to +1.00.
3 month post-op: Haze reaches its peak, and is resolved by 6 mo. P.O.
*Treatment course continues along standard protocol.

Type 2: 2-3% of patients. Labeled as "inadequate healers."
1 month post-op: Clear corneas and a hyperopic RE of up to +1.75 D.
*Treatment involves the abrupt discontinuation of steroids to stimulate the healing response. Further action may entail use of EW SCL's or epithelial debridement.

Type 3: 1-3% of patients. Labeled as "over-aggressive healers."
1 month post-op: Normal - trace haze and RE of +0.50 to -0.50D. (Appear as type 1 at this point).
3 month post-op: Increased haze with a RE of up to -1.50D.
*Treatment requires a higher dosage of steroids (pred forte, qid) to stop the healing response (fibrosis and hyperplasia of the central cornea).

A Summit follow up study found that when these patient types were observed and their treatments were adjusted accordingly, their 1 year post-operative uncorrected visual acuity's were significantly improved4,5.
Patients in this study followed the standard protocol for postoperative treatment (and whether or not patients complied to this regimen is another variable in itself). Perhaps had these 3 patient types been detected and treated, the 1 year post-operative acuity's in this study would have been improved.

**Sex and Age of Patient**

All RK studies suggest that as the patients age increases, the greater the effect of the RK incisions. This approximates -0.75D to -1.00D more of a myopic effect per decade\textsuperscript{12,18,23}. The age range of RK patients in this study went from 21 to 56 years, with a mean age of 39.76. 16% were in their 20's, 18% in their 30's, 60% in their 40's and the remaining 6% were in their 50's at the time of surgery. Postoperative visual acuity's were, on average, 20/80 for those in their 20's and 30's, 20/30 for the 40 year-olds, and 20/25 for the 50 year olds.

Surgeons in this study did not use age as a major surgical outcome factor. It is apparent that there is a trend here which supports previous literature. Perhaps the younger populations should have been treated more aggressively than they were.

**Individual Patient Characteristics**

There are several other factors which vary from patient to patient which must be considered by the surgeon in order to achieve the greatest accuracy. These include the pre-operative intra-ocular pressure, ocular rigidity, axial length and specific characteristics of the cornea (thickness, curvature, diameter, topography). Also, general physiologic variables between people. These factors are all difficult to measure and predict their direct effects on surgical outcome. Philosophies on this varies from surgeon to surgeon, but they must be mentioned as factors which may have influenced the visual acuity's in this study. They were most likely not a result of
surgical variance, as a standard protocol is used when considering these areas before any surgery\textsuperscript{1,6,11,14}.

**Side Effects and Complications**

Complications and side effects as a result of RK that may affect or disrupt visual acuity can be divided into temporary or long-term (permanent). Temporary side effects associated with RK include glare, disruption of binocular vision, and diurnal fluctuating vision that typically becomes less noticeable between three months and a year. Long-term complications that may result which can lead to decreased visual function are consecutive hyperopia, overcorrection or undercorrection, and irregular astigmatism which can cause persistent ghost images or monocular diplopia. In rare cases, cataracts, endophthalmitis, and the need for corneal transplant have been noted to decrease visual function \textsuperscript{7,12,21,23}. These provide more possible explanations as to why the RK patients achieved worse visual acuity's in this study in comparison to the PRK subjects.

Early post-operative side effects associated with PRK involve glare and halos\textsuperscript{19,25}. In fact, the most common post-operative complaint of patients is the visual acuity loss due to these two factors\textsuperscript{6}. Refractive complications seen with PRK that can lead to loss of visual function include overcorrection, undercorrection, central islands, and decentration which occurs if the laser beam is not perfectly aligned properly with the surgeon's eyepiece or if there is poor patient fixation. Late post-operative complications found with PRK can manifest as corneal haze, which corresponds to a corneal healing response. Haze can result from activation and migration of keratocytes, discontinuity in interlamellar alignment, vacuoles between lamellae, and/or newly synthesized collagen. An additional late post-operative complication with PRK is myopic regression\textsuperscript{1,2,3,4,5,6,9,10,11,19,25}. Both of these conditions account for loss of visual acuity.

**CONCLUSION**
When comparing the one year post-operative results of RK and PRK, the latter resulted in significantly better uncorrected visual acuity's. For individuals interested in RK, 22% of the patients had uncorrected visual acuity's less than 20/40. These results are based solely on post-operative Snellen visual acuity analysis. No attempt was made to evaluate overall patient satisfaction with their post-surgical result. In other words, the quality of visual perception, both subjectively and objectively, were not considered. There was also no attempt made to learn the incidence and success of secondary surgeries performed on this studies patients.

This information should be helpful to eye care professionals in educating patients on the options of PRK and RK for refractive surgery.

WORKS CITED


<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>PRK Post-op RE's</th>
<th>RK Post-op RE's</th>
<th>PRK Pre-op RE</th>
<th>RK Pre-op RE's</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-0.37</td>
<td>-2.25</td>
<td>-4</td>
<td>-4.25</td>
</tr>
<tr>
<td>2</td>
<td>-0.87</td>
<td>0</td>
<td>-4</td>
<td>-4.12</td>
</tr>
<tr>
<td>3</td>
<td>-0.12</td>
<td>-1</td>
<td>-3.5</td>
<td>-3.25</td>
</tr>
<tr>
<td>4</td>
<td>0.25</td>
<td>-0.5</td>
<td>-1.87</td>
<td>-1.75</td>
</tr>
<tr>
<td>5</td>
<td>0.25</td>
<td>-1.75</td>
<td>-7.75</td>
<td>-7.87</td>
</tr>
<tr>
<td>6</td>
<td>-0.87</td>
<td>-0.62</td>
<td>-3.25</td>
<td>-3.25</td>
</tr>
<tr>
<td>7</td>
<td>-0.5</td>
<td>-0.25</td>
<td>-2.75</td>
<td>-2.5</td>
</tr>
<tr>
<td>8</td>
<td>-0.75</td>
<td>-0.87</td>
<td>-2.75</td>
<td>-3</td>
</tr>
<tr>
<td>9</td>
<td>-0.5</td>
<td>0.75</td>
<td>-2.75</td>
<td>-2.87</td>
</tr>
<tr>
<td>10</td>
<td>-2.5</td>
<td>-0.62</td>
<td>-8.5</td>
<td>-8.75</td>
</tr>
<tr>
<td>11</td>
<td>0.75</td>
<td>-0.75</td>
<td>-5.5</td>
<td>-5.37</td>
</tr>
<tr>
<td>12</td>
<td>-0.25</td>
<td>-3</td>
<td>-6</td>
<td>-6.37</td>
</tr>
<tr>
<td>13</td>
<td>-0.25</td>
<td>-1.62</td>
<td>-2.87</td>
<td>-3.25</td>
</tr>
<tr>
<td>14</td>
<td>0.75</td>
<td>-0.75</td>
<td>-6.87</td>
<td>-7</td>
</tr>
<tr>
<td>15</td>
<td>-0.12</td>
<td>-1</td>
<td>-2.75</td>
<td>-3</td>
</tr>
<tr>
<td>16</td>
<td>-0.5</td>
<td>0.5</td>
<td>-3.5</td>
<td>-3.5</td>
</tr>
<tr>
<td>17</td>
<td>-0.75</td>
<td>-2</td>
<td>-3.5</td>
<td>-3.25</td>
</tr>
<tr>
<td>18</td>
<td>0.75</td>
<td>0.5</td>
<td>-2.5</td>
<td>-2.75</td>
</tr>
<tr>
<td>19</td>
<td>0</td>
<td>-1.25</td>
<td>-3.5</td>
<td>-3.37</td>
</tr>
<tr>
<td>20</td>
<td>0</td>
<td>-0.5</td>
<td>-2.87</td>
<td>-3</td>
</tr>
<tr>
<td>21</td>
<td>0.12</td>
<td>-0.75</td>
<td>-4.25</td>
<td>-4.5</td>
</tr>
<tr>
<td>22</td>
<td>-0.5</td>
<td>0</td>
<td>-4</td>
<td>-4.5</td>
</tr>
<tr>
<td>23</td>
<td>-0.75</td>
<td>-0.5</td>
<td>-2.5</td>
<td>-2.25</td>
</tr>
<tr>
<td>24</td>
<td>-0.75</td>
<td>-1</td>
<td>-6.25</td>
<td>-6.12</td>
</tr>
<tr>
<td>25</td>
<td>-0.25</td>
<td>0.25</td>
<td>-2.75</td>
<td>-2.75</td>
</tr>
<tr>
<td>26</td>
<td>0.37</td>
<td>-2.62</td>
<td>-3.87</td>
<td>-3.62</td>
</tr>
<tr>
<td>27</td>
<td>-0.25</td>
<td>0.25</td>
<td>-4</td>
<td>-3.62</td>
</tr>
<tr>
<td>28</td>
<td>0.25</td>
<td>-1</td>
<td>-3.25</td>
<td>-3.12</td>
</tr>
<tr>
<td>29</td>
<td>-0.5</td>
<td>-5</td>
<td>-6.75</td>
<td>-6.5</td>
</tr>
<tr>
<td>30</td>
<td>0.25</td>
<td>-0.5</td>
<td>-1.75</td>
<td>-1.75</td>
</tr>
<tr>
<td>31</td>
<td>-0.25</td>
<td>-0.25</td>
<td>-2.5</td>
<td>-2.5</td>
</tr>
<tr>
<td>32</td>
<td>-0.25</td>
<td>0</td>
<td>-3.5</td>
<td>-3.75</td>
</tr>
<tr>
<td>33</td>
<td>0.25</td>
<td>-0.75</td>
<td>-4</td>
<td>-3.62</td>
</tr>
<tr>
<td>34</td>
<td>-0.37</td>
<td>-3.25</td>
<td>-5.5</td>
<td>-6.12</td>
</tr>
<tr>
<td>35</td>
<td>-0.5</td>
<td>-2.75</td>
<td>-6.25</td>
<td>-7.25</td>
</tr>
<tr>
<td>36</td>
<td>0.12</td>
<td>-0.87</td>
<td>-3.25</td>
<td>-3</td>
</tr>
<tr>
<td>37</td>
<td>0</td>
<td>0</td>
<td>-2</td>
<td>-1.5</td>
</tr>
<tr>
<td>38</td>
<td>-0.25</td>
<td>-0.12</td>
<td>-3</td>
<td>-3.12</td>
</tr>
<tr>
<td>39</td>
<td>-0.75</td>
<td>-0.12</td>
<td>-2.62</td>
<td>-2.75</td>
</tr>
<tr>
<td>40</td>
<td>0</td>
<td>-0.75</td>
<td>-3.5</td>
<td>-3.25</td>
</tr>
<tr>
<td>41</td>
<td>-0.62</td>
<td>-4.75</td>
<td>-5.5</td>
<td>-6</td>
</tr>
<tr>
<td>42</td>
<td>-0.37</td>
<td>-0.25</td>
<td>-3</td>
<td>-3.12</td>
</tr>
<tr>
<td>43</td>
<td>0.37</td>
<td>-1.62</td>
<td>-4.5</td>
<td>-4</td>
</tr>
<tr>
<td>44</td>
<td>-0.5</td>
<td>-3.25</td>
<td>-5.75</td>
<td>-6.25</td>
</tr>
<tr>
<td>45</td>
<td>0</td>
<td>0.75</td>
<td>-1.62</td>
<td>-1.12</td>
</tr>
</tbody>
</table>
### Appendix 1 (a)

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>46</td>
<td>-0.5</td>
<td>-1.5</td>
<td>-4.5</td>
<td>-5</td>
</tr>
<tr>
<td>47</td>
<td>-0.5</td>
<td>-1.87</td>
<td>-5.37</td>
<td>-5.37</td>
</tr>
<tr>
<td>48</td>
<td>0.5</td>
<td>-1.5</td>
<td>-3.75</td>
<td>-3.25</td>
</tr>
<tr>
<td>49</td>
<td>-0.25</td>
<td>0</td>
<td>-4.62</td>
<td>-5.12</td>
</tr>
<tr>
<td>50</td>
<td>-0.5</td>
<td>-0.75</td>
<td>-5</td>
<td>-4.5</td>
</tr>
<tr>
<td>Subject</td>
<td>BCVA pre-op RK</td>
<td>BCVA post-op RK</td>
<td>BCVA pre-op PRK</td>
<td>BCVA post-op PRK</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>----------------</td>
<td>-----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>25</td>
<td>25</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>7</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>11</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>12</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>13</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>14</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>15</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>16</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>17</td>
<td>20</td>
<td>20</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>18</td>
<td>20</td>
<td>20</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>19</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>21</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>22</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>23</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>24</td>
<td>20</td>
<td>20</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>25</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>26</td>
<td>20</td>
<td>20</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>27</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>28</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>29</td>
<td>20</td>
<td>20</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>30</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>31</td>
<td>25</td>
<td>30</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>32</td>
<td>30</td>
<td>30</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>33</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>34</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>35</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>36</td>
<td>20</td>
<td>25</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>37</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>38</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>39</td>
<td>20</td>
<td>20</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>40</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>41</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>42</td>
<td>20</td>
<td>20</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>43</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>44</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>45</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>46</td>
<td>20</td>
<td>20</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>47</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>48</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>49</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>50</td>
<td>20</td>
<td>20</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Subject</td>
<td>PRK SEX</td>
<td>RK SEX</td>
<td>PRK AGE</td>
<td>RK AGE</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>--------</td>
<td>---------</td>
<td>--------</td>
</tr>
<tr>
<td>1</td>
<td>M</td>
<td>M</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>M</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>M</td>
<td>41</td>
<td>41</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>F</td>
<td>41</td>
<td>42</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>F</td>
<td>43</td>
<td>44</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>M</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>M</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>M</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>9</td>
<td>M</td>
<td>F</td>
<td>46</td>
<td>47</td>
</tr>
<tr>
<td>10</td>
<td>M</td>
<td>M</td>
<td>48</td>
<td>47</td>
</tr>
<tr>
<td>11</td>
<td>M</td>
<td>M</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>12</td>
<td>M</td>
<td>M</td>
<td>43</td>
<td>42</td>
</tr>
<tr>
<td>13</td>
<td>F</td>
<td>F</td>
<td>44</td>
<td>43</td>
</tr>
<tr>
<td>14</td>
<td>F</td>
<td>M</td>
<td>42</td>
<td>42</td>
</tr>
<tr>
<td>15</td>
<td>F</td>
<td>M</td>
<td>39</td>
<td>40</td>
</tr>
<tr>
<td>16</td>
<td>M</td>
<td>F</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td>17</td>
<td>M</td>
<td>M</td>
<td>41</td>
<td>41</td>
</tr>
<tr>
<td>18</td>
<td>M</td>
<td>M</td>
<td>31</td>
<td>30</td>
</tr>
<tr>
<td>19</td>
<td>M</td>
<td>M</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>20</td>
<td>M</td>
<td>M</td>
<td>41</td>
<td>41</td>
</tr>
<tr>
<td>21</td>
<td>M</td>
<td>M</td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>22</td>
<td>M</td>
<td>M</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>23</td>
<td>F</td>
<td>M</td>
<td>45</td>
<td>44</td>
</tr>
<tr>
<td>24</td>
<td>M</td>
<td>M</td>
<td>49</td>
<td>48</td>
</tr>
<tr>
<td>25</td>
<td>F</td>
<td>M</td>
<td>32</td>
<td>31</td>
</tr>
<tr>
<td>26</td>
<td>M</td>
<td>F</td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>27</td>
<td>F</td>
<td>M</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>28</td>
<td>F</td>
<td>M</td>
<td>32</td>
<td>31</td>
</tr>
<tr>
<td>29</td>
<td>M</td>
<td>F</td>
<td>32</td>
<td>31</td>
</tr>
<tr>
<td>30</td>
<td>M</td>
<td>M</td>
<td>43</td>
<td>44</td>
</tr>
<tr>
<td>31</td>
<td>F</td>
<td>F</td>
<td>47</td>
<td>48</td>
</tr>
<tr>
<td>32</td>
<td>M</td>
<td>F</td>
<td>50</td>
<td>49</td>
</tr>
<tr>
<td>33</td>
<td>F</td>
<td>F</td>
<td>44</td>
<td>43</td>
</tr>
<tr>
<td>34</td>
<td>M</td>
<td>M</td>
<td>33</td>
<td>34</td>
</tr>
<tr>
<td>35</td>
<td>F</td>
<td>F</td>
<td>43</td>
<td>44</td>
</tr>
<tr>
<td>36</td>
<td>M</td>
<td>F</td>
<td>47</td>
<td>47</td>
</tr>
<tr>
<td>37</td>
<td>F</td>
<td>F</td>
<td>40</td>
<td>39</td>
</tr>
<tr>
<td>38</td>
<td>F</td>
<td>M</td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>39</td>
<td>M</td>
<td>F</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>40</td>
<td>F</td>
<td>F</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>41</td>
<td>F</td>
<td>F</td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td>42</td>
<td>F</td>
<td>F</td>
<td>45</td>
<td>46</td>
</tr>
<tr>
<td>43</td>
<td>F</td>
<td>F</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>44</td>
<td>F</td>
<td>M</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>45</td>
<td>M</td>
<td>F</td>
<td>41</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>F</td>
<td>M</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>47</td>
<td>F</td>
<td>F</td>
<td>24</td>
<td>23</td>
</tr>
<tr>
<td>48</td>
<td>M</td>
<td>F</td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>49</td>
<td>F</td>
<td>M</td>
<td>44</td>
<td>45</td>
</tr>
<tr>
<td>50</td>
<td>M</td>
<td>M</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>SUBJECT</td>
<td>PRK Post-op Visual Acuity</td>
<td>RK Post-op Visual Acuity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------</td>
<td>--------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>25</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>20</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>20</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>30</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>25</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>30</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>25</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>20</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>20</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>40</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>20</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>25</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>30</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>20</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>20</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>25</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>25</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>15</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>25</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>20</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>25</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>20</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>20</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>25</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>20</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>20</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>20</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>20</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>25</td>
<td>400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>20</td>
<td>400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>20</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>20</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>25</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>30</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>20</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>30</td>
<td>400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>25</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>20</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>25</td>
<td>400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>20</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>30</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>30</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>20</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>20</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>30</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUBJECT</td>
<td>PRK Post-op logMAR Visual Acuity</td>
<td>RK Post-op logMAR Visual Acuity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------</td>
<td>---------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.097</td>
<td>0.699</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.301</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0.097</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0.097</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0.301</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0.176</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0.176</td>
<td>0.097</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.097</td>
<td>0.301</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0.176</td>
<td>0.176</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>0.097</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>0.097</td>
<td>0.301</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0</td>
<td>1.176</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>0</td>
<td>0.301</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>0.301</td>
<td>0.301</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>0</td>
<td>0.176</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>0.097</td>
<td>0.097</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>0.176</td>
<td>0.602</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>0</td>
<td>0.097</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>0</td>
<td>0.398</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>0.097</td>
<td>0.176</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>0.097</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>-0.125</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>0.097</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>0</td>
<td>0.176</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>0.097</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>0</td>
<td>0.301</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>0.097</td>
<td>1.301</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>0</td>
<td>0.176</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>0.097</td>
<td>1.301</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>0</td>
<td>1.301</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>0</td>
<td>0.176</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>0</td>
<td>0.097</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>0.097</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>0.176</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>0</td>
<td>0.176</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>0.176</td>
<td>1.301</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>0.097</td>
<td>0.097</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>0</td>
<td>0.477</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>0.097</td>
<td>1.301</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>0</td>
<td>0.176</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----</td>
<td>-----</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>0.176</td>
<td>0.477</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>0.176</td>
<td>0.477</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>0</td>
<td>0.477</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>0</td>
<td>0.301</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>0.176</td>
<td>0.097</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>