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Refractive surgery questionnaire

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REFRACTIVE SURGERY QUESTIONNAIRE

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Refractive Surgery Questionnaire

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INTRODUCTION

Mass advertisement of refractive surgery has fueled patient interest in the various procedures. In 1999 approximately 500,000 Americans will undergo refractive surgery, up from 30,000 in 1990. As techniques improve and costs decline, this number is expected to dramatically increase. Therefore, a greater number of patients will be consulting their eyecare provider as to whether or not they may be a candidate for refractive surgery.

A detailed ocular examination is essential in determining the patient's refractive and physiologic suitability for refractive surgery, however additional information is equally critical regarding patient's attitudes and expectations. To better identify these traits, we developed a questionnaire for screening potential refractive surgery candidates.

HISTORY

Nearsighted people have sought ways to rid themselves of their glasses for centuries. Tradition says the ancient (presumably myopic) Chinese slept with sandbags on their eyes to flatten their corneas. In the mid-1800's Dr. J. Ball advertised an eye cup with a small spring-mounted mallet that struck the cornea through the closed eyelid. "It restores your eyesight and renders spectacles useless," he claimed (Table 1-1).

The most popular unorthodox method of treating refractive errors in the United States originated with William H. Bates, M.D., an eccentric physician who attributed all refractive errors to eye strain that resulted from an "abnormal condition of the mind" and who prescribed a series of exercise—both physical and mental—to restore normal vision. His book published by the Central Fixation Publishing Company in 1920, the *Care of Imperfect Sight By Treatment Without Glasses,* has been plagiarized and popularized to this day, attracting adherents no less famous than Aldous Huxley. Bates had another distinction: in 1894, he described crescentic keratotomy incisions to reduce astigmatism, but true to his philosophy he attributed the refractive change not to alterations in corneal shape, but to swelling of the lens or lengthening of the eyeball.

The keratotomy procedure, mainstay of refractive surgery for the first 100 years, is the subject of this historical survey.

Nineteenth Century European Studies

Dr. L. J. Lans, working in Leiden, The Netherlands, published in 1898 the results of his experiments in rabbits, employing keratectomy, keratotomy, and thermokeratoplasty to treat astigmatism. After studying radial incisions, he enunciated the basic principles underlying keratotomy: 1)The cornea flattens in the meridian of the incision. 2)Some of the effect is lost as the incision heals. 3)The incisions must penetrate deeply in the cornea to obtain an effect. Studies on the management of astigmatism with corneal surgery were also conducted by Italian and German surgeons in the late 1800's (Table 1-1).

TABLE 1-1
Evolution of Radial Keratotomy

Year	Author	Major Contributions
1898	Lans	• Radial incision flattens cornea in axis of incision • Deep incision more effective • Effect reduced during healing • Experiments in rabbits for astigmatism
1939-1955	Sato	• Anterior and posterior radial incisions for astigmatism, keratoconus, myopia • Corneal edema 20 years postoperatively
1969-1977	Yenaliev	• Anterior radial incisions • 32 and 12 incisions
1972-present	Fyodorov	• Multifactorial predictive formula • Varied size of clear zone • 16 incisions across limbus
1978-present	Americans	• Ultrasonic pachymeters • Diamond micrometer knives • 8 and 4 incisions • Deepening incisions • Prospective clinical trials

Anterior and Posterior Keratotomy in Japan

In 1933, Dr. Tsutomu Sato, working in Tokyo, observed a patient with keratoconus who developed an acute break in Descemet's membrane (acute hydrops) followed by spontaneous healing, flattening of the cornea and improvement of vision. After observing a similar patient in 1936, Sato thought that incisions made deliberately through the corneal endothelium and Descemet's membrane would be beneficial in the treatment of keratoconus. To implement his idea, he developed a tapered, sharply angulated knife that enabled him to make transverse incisions in the posterior surface of the cornea. In 1939, on the basis of experience with 21 patients, he proposed the operation for the cure of keratoconus and astigmatism.

In collaboration with Dr. Koichiro Akiyama, Sato also performed numerous laboratory experiments to try to define the pattern of incisions that would be most effective in modifying corneal shape. He settled on two basic patterns: posterior transverse incisions in the steep axis for mild astigmatism and posterior transverse and posterior radial incisions for more severe astigmatism.

However, he observed that the operations were not predicable enough to achieve the full desired hypermetropic effect. Therefore, to gain greater flattening of the cornea, particularly in the management of myopia, Sato increased the number of radial incisions through Descemet's membrane to approximately 45 and added 40 radial incisions throughout the anterior surface of the cornea with a trachoma knife (Figure 1). He outlined the approximately 5mm central clear zone with a circular hair that laid on the epithelial surface.

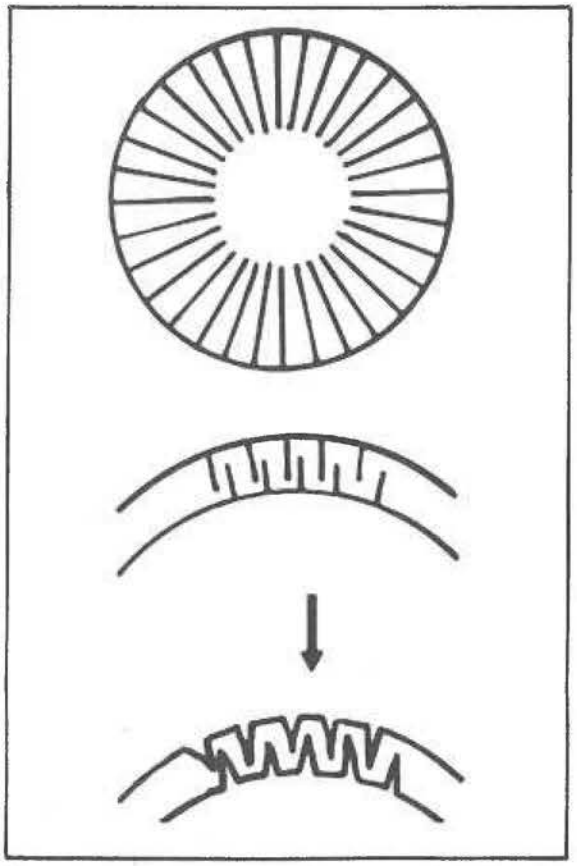

Figure 1 Multiple corneal incisions were made both on the anterior and posterior surfaces of the cornea.

In 32 cases followed for a period of 3 to 18 weeks, he reported a mean reduction in refractive myopia of 2.80D, with a range of 1.5 to 7.00D. He observed that the deeper cuts and the posterior cuts produced the greatest corneal flattening. Akiyama reported on the postoperative changes in keratometry measurements in 172 eyes operated on by the Sato method. The average change was a flattening of 3.20D with a range of +0.50 to –11.05D, 70% of the eyes achieving an effect between –1.5 to –4.00D.

On the basis of this work Sato drew two extraordinary conclusions: "This new surgical approach is a proven safe method which definitely cures or adequately alleviates over 95% of all cases of myopia in Japan"..."no detrimental effects from this procedure have been observed".

Sato operated on approximately 680 eyes for myopia at Juntendo University between 1951 and 1959. Investigators at Juntendo University in Tokyo have followed 80 of these eyes in 50 patients from 1971 through 1980, observing that 69 of the eyes (86%) developed bullous keratopathy an average of 20 years after surgery (Table 1-2). In some patients, there was a curling and protrusion of slivers of Descemet's membrane into the anterior chamber. In other patients who had relatively clear corneas, corneal guttata were present and specular microscopy showed disruption of the endothelial mosaic. When

Kanai and his co-workers examined the ultrastructure of seven corneal buttons removed at keratoplasty, they found intercellular and intracellular epithelial edema, disrupted epithelial basement membrane and Bowman's layer, increased interfibrillar distance in the stroma, and abnormal collagenous material posterior to the normal portion of Descemet's membrane. The endothelium was absent.

Clearly, the incisions into the posterior cornea damaged the endothelium, but it had enough reserve to maintain corneal clarity in many eyes for a decade or two before it failed. Sato stopped doing his myopia surgery as soon as contact lenses were introduced into his practice, before the rash of edematous corneas appeared.

TABLE 1-2
Time of Onset of Corneal Edema After Sato's Anterior and Posterior Radial Keratotomy

Age of patients when surgery was done (yrs)	No. of eyes	Bullous keratopathy: Mean age at onset (yrs)	Bullous keratopathy: Mean time after surgery (yrs)
Myopia			
14 to 19	18	38.5	19.9
20 to 24	28	41.1	19.4
25 and older	17	43.5	16.5
Myopic astigmatism			
16 to 34	6	43.8	22.3

Anterior Radial Keratotomy in the Soviet Union And India

B.S. Yenaliev, working in the Soviet Union, was aware of the corneal edema that resulted from Sato's posterior incision, and confined his research to keratotomy incisions through the anterior cornea only. Between 1969 and 1977 he performed anterior keratotomy in 426 eyes using 24 incisions in 290, 12 incisions in 50, 8 incisions in 30, and 4 incisions in 56 cases. He reported that 73.5% of 242 eyes followed for at least 6 months showed stable results. He thought the operation could decrease myopia of up to 4D.

In 1972, Dr. Svyatoslav N. Fyodorov of Moscow began studying anterior radial corneal incisions for myopia. Working with Valery Durnev, he found that partial penetrating radial corneal incisions in 150 rabbits reduced the power of the central cornea 2.00 to 3.00D in nearly all cases. He suggested that cutting a peripheral circular ligament of the cornea accounted for the change in corneal curvature.

In 1974, Fyodorov began keratotomy surgery in humans and over the next few years made a series of observations:

1. Sixteen incisions gave almost the same results as did 20, 24 and 32 incisions. For example, in 546 eyes, 16 incisions gave an average decrease in corneal power of 2.77 +/- 0.19D while 32 incisions in 22 eyes gave an average reduction of 2.79 +/- 0.03D.
2. Larger diameter corneas had greater flattening, those in the 10 to 11mm range giving about 2.00D of effect while those in the 13mm range gave about 4.00D of effect.
3. Steeper corneas gave a greater effect with those in the 40.00 to 41.00D range flattening about 2.00D, while those in the 44.00 to 45.00D range flatten about 4.00 to 5.00D.
4. A smaller diameter of the central clear zone gave a greater reduction in myopia, a 3.0mm clear zone gave about 4.00D of effect, while a 5.0mm zone gave about 1.00D of effect.
5. The coefficient of scleral rigidity, which increases with age, affected the result: the higher the coefficient, the greater the reduction in myopia.

Fyodorov and his colleagues reported their early experiments in a brief book written in Russian. Their first report in English involved 60 eyes in 30 patients followed from 6 months to 3 years and, in an addendum, was expanded to a total of 676 eyes followed for more than 1 year. Of 130 patients whose initial refraction ranged from –0.75 to –3D, 111 (82.4%) achieved better than 20/25 acuity without correction. Of the 546 patients whose preoperative refraction ranged from –3.25 to –6.00D 203 (37%) achieved 20/25 visual acuity or better. Fyodorov claimed that the surgically induced corneal flattening reversed somewhat in the first 3 to 4 months postoperatively, and then stabilized indefinitely, Except for three corneal perforations, he stated there were no complications.

Fyodorov updated his results in a report of 500 eyes in 1983. He described a guarded micrometer knife that advanced a razor blade fragment to a specified length, which he calculated preoperatively with a computer. With this approach, he claimed that 100% or 230 eyes with an initial refraction of –1.00 to –6.00D were corrected to within 0.50D of emmetropia. Fyodorov and Durnev also reported their results of radial keratotomy for astigmatism.

Dr. P. Siva-Reddy of Hyderabad, India, who learned radial keratotomy from Fyodorov, published the results of radial keratotomy in 200 myopic eyes done between 1975 and 1977 and followed from 3 to 22 months, including simple, high and progressive types of myopia. He found that only 40% of cases maintained a visual acuity of 20/60 or better 1 month or more after surgery. The article presents scant details of the surgical technique, but Dr. Siva-Reddy stated in 1980, that he used very superficial incisions, approximately at the level of Bowman's layer, which helps explain the poor results.

Radial Keratotomy in the United States

Political Development. In 1976, Dr. L. Bores visited Fyodorov in Moscow to study intraocular lens implants, observe the radial keratotomy procedure, and perform a series of cases. Later that year, Fyodorov lectured at the Kresge Eye Institute in Detroit. In 1977, Bores returned to Moscow and observed good results in the cases he had performed. He began to do radial keratotomy in the United States in 1978. Considerable publicity about the surgery in the lay and medical media created a groundswell of interest among both myopic individuals and vision care specialists.

In 1980, three groups of ophthalmologists held meetings to study radial keratotomy. The National Radial Keratotomy Study Group was originally comprised of approximately 30 ophthalmologists and later expanded to a large number certified in courses, who were encouraged to send their preoperative and postoperative measurements on data forms to a central location for computer-assisted analysis. The Keratorefractive Society held an annual meeting, the proceedings of which were published, and established a registry to which members were encouraged to send their results and complications of radial keratotomy. A Workshop of Radial Keratotomy for Myopia was attended by 15 ophthalmologists who began to design a clinical protocol that later became the Prospective Evaluation of Radial Keratotomy (PERK) Study. In 1981, an ad hoc committee of the American Academy of Ophthalmology was established to gather data from practitioners on radial keratotomy

In 1981, some members of the National Radial Keratotomy Study Group and of the Keratorefractive Society claimed they had data that proved the safety and efficacy of radial keratotomy and sought to block the establishment of the Prospective Evaluation of Radial Keratotomy (PERK) Study, a multi-center clinical trial to be funded by the National Institutes of Health. To evaluate this claim, the National Eye Institute and a United States congressman convened a panel of ophthalmologists and statisticians that requested written summaries of the data and then met with representatives of the groups in Washington, D.C. Neither collaborative group submitted data. After hearing individual presentations and studying written material from individual ophthalmologists, the panel concluded that the information was "grossly inadequate" to evaluate the safety and efficacy of radial keratotomy, although the quality of the data exceeded that collected in the routine office practice of ophthalmology.

In 1981, the National Eye Institute funded nine clinical centers and one statistical center to comprise the PERK Study that was designed to evaluate the efficacy, safety, predictability, and stability of one standardized technique of radial keratotomy over 5 years. The study was a cooperative effort between ophthalmologists in private practice and university-based investigators.

Another cooperative study between private and university-base ophthalmologists was established in 1981 as the Analysis of Radial Keratotomy (ARK) study, the goal of which was to garner rigorously collected data from the clinical practices of individual ophthalmologists and to employ the skills of a data analyst and a biostatician in compiling and analyzing the results. The findings from members of this group have been published, although the group disbanded in 1983.

Clinical Development The basic techniques proffered by Yenaliev and by Fyodorov have undergone a steady evolution in the United States through the work of many clinical and laboratory investigators. These changes are summarized below in a series of informal generalizations.

1. Laboratory experiments and rigorous clinical trials have evaluated scientifically early claims about the surgery.
2. Patient desire to see normally without corrective lenses is the major motivation for surgery, not appearance, occupation or convenience.
3. Topical anesthesia has replaced retrobulbar anesthesia.
4. A constricted pupil is now preferred to the originally advocated dilated pupil.
5. The number of incisions has generally declined from 16 to 12 to 8 to 4 because most of the effect of the surgery is achieved with the first few incisions.
6. Incisions are confined to the cornea, rather than extending across the limbus.
7. The paracentral part of the incision is thought to have the most effect, rather than the originally proposed peripheral part.
8. Most surgeons now cut toward the peripheral cornea, rather than toward the central.
9. Blade settings have lengthened from 90% to about 110% of central corneal thickness, in attempts to achieve deeper incisions without corneal perforation.
10. Debate continues regarding the efficacy of additional peripheral deepening incisions.
11. Repeat operations are done with the incisions between, rather than within, the previous scars.
12. Early claims of accurately predictable results for individual patients have been replaced by appreciation that individual outcomes may vary greatly, i.e., there are "underreactors" and "overreactors".
13. Attempts to apply multiple regression equations to increase the predictability of outcome have emerged.
14. The role of preoperative and intraoperative variables is becoming better defined. Patient age, preoperative refraction, diameter of the clear zone and depth of incision seems most important. Number of incisions, patient sex, corneal curvature, preoperative intraocular pressure, ocular rigidity, corneal diameter, and corneal thickness have a minor influence, if any, on outcome.
15. Initial claims that the corneas stabilized by 3 months after surgery have been replaced by appreciation that changes in refraction may continue for years after surgery because the cornea heals slowly.
16. Disabling glare, once feared to be a persistent, serious problem, occurs rarely after a properly done, uncomplicated radial keratotomy.

Summary

Radial keratotomy is now 100 years old, yet the operation continues to change and develop. After a multinational gestation period, the procedure has matured in the hands of many ophthalmologists in the United States who have contributed to our increasing fund of knowledge about the nature of radial keratotomy. The 1990's saw great advances in technology and technique, with new methods arising to rival radial keratotomy in popularity and effectiveness. Today, lasers play a major role in refractive surgery along with the more traditional techniques. In the near future, we may even see drugs developed to control corneal wound healing and promote better outcomes. We will next examine the various techniques and procedures surgeons now employ with lasers and other tools to correct refractive errors.

REFRACTIVE SURGERY DESCRIPTIONS

RADIAL KERATOTOMY (RK)

-Incisions are made with a diamond blade into the cornea in a spoke-like configuration
-Peripheral cornea bows outward in the area of the incisions and the central cornea flattens
-Treatment for low degrees of nearsightedness

ASTIGMATIC KERATOTOMY (AK)

-Curved incisions are made to allow the cornea to assume a more spherical shape
-Can be combined with RK to treat lower degrees of nearsightedness and astigmatism.

PHOTOREFRACTIVE KERATECTOMY (PRK)

-Excimer laser permanently sculpts the front surface of the cornea
-Surface cells are removed surgically and the laser reshapes the cornea
-Treatment for nearsightedness and astigmatism

LASER ASSISTED IN-SITU KERATOMILEUSIS (LASIK)

-Treats wide range of nearsightedness and astigmatism
-Thin corneal flap is made, folded back and the excimer laser treats the underlying -corneal tissue

Astigmatic Keratotomy (AK)

AK is similar to RK except that curved incisions are made to allow for a more spherical shaped cornea. It is often combined with RK.

Photorefractive keratectomy (PRK)

PRK uses an excimer laser with a 193nm UV radiation beam, which is used to remove some of the cornea's inner layer, causing the cornea to flatten. The laser has the capability of removing 0.25 millimicron-sized pieces of tissue. The excimer laser uses a single-pass technique and the ablation zone spans approximately 6 mm. The patient is left with a corneal abrasion that must heal.

Laser Assisted In-situ Keratomileusis (LASIK)

LASIK is the surgery used for patients with 6 diopters or more of myopia. It is also used on patients with high astigmia, with the cutoff generally around 3 diopters. The patient is given an oral sedative, a topical anesthetic and a prophylactic antibiotic. The conjunctiva is irrigated and then a suction ring is placed over the eye, which raises the IOP to 65-mm Hg. The surgeon ablates the stromal bed and the flap created by the ablation is then pulled back allowing he surgeon to direct he laser beam pulses onto the cornea's inner layer. The flap is then laid back down. The cost of LASIK, the most expensive of the three, is around $2,500 per eye. Having been approved for a short time, there isn't much data regarding the long-term effects.

The typical LASIK patient will return to functional vision (20/40) within 24 hours, and LASIK is often performed bilaterally. Prophylactic antibiotics and steroids are usually only needed for one week as the risk of infection and pain are greatly reduced because the patient only has a narrow epithelial incision at the edge of the flap.

Disadvantages

The most serious complication in RK, though not very common, is endophthalmitis. Also, the perforations may cause the leakage of aqueous. In addition, the stitches may induce irregular astigmatism. Other side effects which are normal and may be very disruptive to the patient following an RK procedure include minimal to severe ocular pain, fluctuating vision, glare and "star-burst" effects can last for 2 to 3 months whereas the fluctuating vision can last up to 9 months. As previously mentioned, patients are at a much greater risk of developing progressive hyperopia. According to the PERK evaluation, a prospective study of RK five years after surgery, 22% of eyes undergoing RK had a refractive change of 1 diopter or more in the hyperopic direction.

Furthermore, remember that the cornea is weakened severely as a result of the incision. This puts the patient at a greater risk of suffering injury if there is ocular trauma as the incisions may rupture. Finally, the leading cause of new liability claims in eye care over the past fifteen years involves RK. The two most common allegations are that the surgeons used misleading information when soliciting individuals to undergo the procedure and performed the procedure negligently.

Regarding PRK, the chief disadvantage is the pain caused by the denuding of the epithelium. The period of discomfort is about 36 hours, the time needed for re-epithelialization of the cornea. About 5% of patients require a narcotic painkiller during this healing process. Some patients develop a haze from the healing corneal layers that clouds their vision. Also, some develop halos around lights caused by the edge of the ablated area not being outside the optical zone. PRK patients require topical steroids to control inflammation and then must have their IOP monitored monthly. As is the case with both PRK and RK, the greater the correction, the more likely you will run into problems such as vision fluctuations.

There are fewer risks with the LASIK procedure, but a major one still exists because it is a more invasive procedure. The use of the microkeratome complicates the surgery and poses the risk of perforating the anterior chamber. Also, the flap that has been hinged

back onto the cornea may be susceptible to traumatic rupture along the incision line. In this procedure the surgeon must have greater bi-manual dexterity and a more complex surgical plan than needed in RK and PRK.

There exists certain contraindications or risk factors with all three procedures that eliminate potential candidates immediately. They are as follows: 1. Unstable refractive error, possibly induced by diabetes, pregnancy, or keratoconus 2. Ocular disease, such as keratoconus, severe blepharitis, cataracts, or any active ocular inflammation 3. Systemic disease, such as diabetes, collagen or micro-vascular disease, lupus, and rheumatoid arthritis

OVERVIEW OF REFRACTIVE SURGERY QUESTIONNAIRE

This questionnaire is intended to provide the eyecare professional with information related to an individual patient's attitudes and expectations concerning refractive surgery. The questions have been designed to address three major areas related to patient selection.

1. Patient's interest and motivation to pursue refractive surgery
2. Patient's past and present tolerance to contact lenses
3. Patient's ability to acclimate to change

The main body of the questionnaire consists of 21 statements. The responses to choose from are:

1 - Strongly Agree
2 - Somewhat Agree
3 - Neutral
4 - Somewhat Disagree
5 - Strongly Disagree

Due to their importance, separate sections are dedicated to both patients who have worn contact lenses, and/or for patients 40 years of age and older.

The statements address seven areas of key importance when considering refractive surgery. They are: expectations (or outcome), contact lenses, cosmetic (or social), convenience, presbyopia, occupational-recreational and ocular discomfort. While there is overlap between the categories, we have separated the number of statements for each as follows:

Category	Total # of Statements	Statement #'s
Expectations	9	5, 6, 9, 12, 15, 18, 19, 20, 21
Contact Lenses	7	C1-C7
Cosmetic/Social	5	3, 7, 10, 11, 14
Convenience	4	1, 2, 8, 13
Presbyopia	3	P1-P3
Occupational-Recreational	2	4,16
Ocular Discomfort	1	17

Obviously, a patient's lifestyle, attitudes and personality are important considerations. This questionnaire is designed to tease these factors out. To help illicit appropriate, qualitative responses, Likert scaling is used, similar to many surveys and questionnaires administered by psychologists. The patient must select the one option out of five he/she feels most pertains to him/her. With results from such forced choices of the five different options, both patient and eye care professional will arrive more readily at the decision of suitability of surgery for the patient. As patients differ, so will the

weight of different questionnaire statements since some may apply more to one patient than another patient.

The questionnaire is formatted so that lower scores ("agree with the statement") on the first 13 statements suggest a stronger candidate, while lower scores for statements 14 – 21 suggest a poorer candidate. This format helps prevent, to a degree, against patients choosing the same or similar response for every statement, which some might do to improperly make themselves appear to be better candidates than they actually are. Thus, the different sections should be analyzed separately, from which scores can be quickly tallied. Scores can range from 13 to 65 on the first 13 statements, with 13 being the most indicative score of a better candidate and 65 being the most indicative score of a poorer candidate. Scores can range from 8 to 40 for statements 14 to 21 with, opposite from the first section, 40 (the larger value) being the most indicative score of a better candidate and 8 (the lower value) being the most indicative score of a poorer candidate.

It was beyond the scope of this project to administer the questionnaire to several patients who would or will undergo refractive surgery. A study of patients completing the form both before and after surgery, including applicable comments from them, would provide valuable data. Scoring of the questionnaire could then be quantified, and statements could be weighted differently per patients' feedback. At this time, no demarcation lines can be drawn with certainty when scoring the questionnaire. Yet, the clinician will have extra, valuable information to aid in determining the suitability of a patient for refractive surgery once the questionnaire is completed.

REFRACTIVE SURGERY QUESTIONNAIRE

The following questionnaire will serve as a guide in helping me select the most appropriate treatment for your vision. Please answer all the questions as honestly as possible. Thank you for your assistance.

Dr._____

I am interested in refractive surgery because,_____
_____
_____

Age _____
Occupation _____
Hobbies _____

I wear _____ the majority of the time.

_____ No Correction
_____ Glasses
_____ Contact Lenses

After reading each statement, circle the number next to the answer you feel pertains most to you.

1. I dislike having to depend on glasses or contact lenses for correction of my vision.

   1 - Strongly Agree
   2 - Somewhat Agree
   3 - Neutral
   4 - Somewhat Disagree
   5 - Strongly Disagree

2. I worry about losing my glasses or contact lenses and not being able to function in an emergency situation.

   1 - Strongly Agree
   2 - Somewhat Agree
   3 - Neutral
   4 - Somewhat Disagree
   5 - Strongly Disagree

3. I prefer the way I look without glasses.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

4. My glasses or contact lenses are burdensome when it comes to participating in sports or outdoor activities.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

5. I would prefer "good" vision without glasses or contact lenses over "perfect" vision with glasses or contact lenses.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

6. I would be happy if my vision without glasses or contact lenses was improved, even if I still needed to wear some type of corrective lenses part or full-time.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

7. If I had better vision without my glasses or contact lenses, I feel I would have better career opportunities.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

8. I have never liked wearing glasses.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

9. I generally do not have a difficult time adjusting to change in my environment.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

10. I feel my social life would be enhanced if I did not need to wear glasses.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

11. I have always envied people whom do not need to wear glasses or contact lenses.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

12. My glasses or contact lens prescription has changed very little, if any, in the past 12 months.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

13. I find glasses uncomfortable to wear.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

14. I do not mind wearing glasses and, in fact, would feel uncomfortable without them.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

15. I am a perfectionist and small changes or problems tend to bother me.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

16. My hobbies and/or workplace require a significant amount of attention to fine visual details.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

17. I find it difficult to tolerate temporary aches, pains or discomfort.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

18. I find it stressful when things don't work out just the way I planned them to.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

19. I do not adapt well to change in my life.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

20. I would be disappointed if I still needed to wear correction after surgery but was not able to wear contacts as easily as before.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

21. I would consider the surgery a failure if I had to wear correction afterwards to achieve 20/20

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

If you are 40 or older, answer the following 3 questions:

1. I do not wear glasses or contact lenses of any kind when I read or perform tasks at near (at arm's length or closer).

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

2. I use my near vision (as with reading, computer use or other close tasks) for much of the day.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

3. Given the choice, I would choose to have clear distance vision over clear reading, near vision.

    1 - Strongly Agree
    2 - Somewhat Agree
    3 - Neutral
    4 - Somewhat Disagree
    5 - Strongly Disagree

If you have ever worn contact lenses, answer the following questions:

My current status with contact lenses is best described as:
(circle the response which best describes your current contact lens wearing habits)

- I have worn contact lenses in the past, but I currently wear glasses full time.
- I presently wear contact lenses intermittently. (only on occasion)
- I wear contact lenses everyday, but my wearing time is limited to less than 8 hours a day.
- I wear my contact lenses full time. (8 to 16 hours a day)
- I wear my contact lenses on an extended wear (overnight) schedule.

If you have, in the past, or are currently wearing contact lenses, please fill in the following:
(select as many as applicable)

- Hard lenses for _____years/months.
- Rigid Gas Permeable lenses for _____years/months.
- Soft lenses for _____years/months.
- Toric soft lenses for _____years/months.
- Disposable soft lenses for _____years/months.

If you are currently wearing hard or gas permeable contact lenses, what lens care cleaning product(s) are you using:

- Boston Cleaner/Conditioner
- Alcon Soaklens
- Allergan Wet-N-Soak
- Barnes Hinds Comfort Care
- Boston Advanced Cleaner/Conditioner
- Alcon Opti-Soak
- Sherman D Stat
- Lobob Cleaner and wetting solution
- Other, Please specify_____

If you are currently wearing soft contact lenses, what lens care cleaning product(s) are you using:

- Alcon Opti-free
- Allergan Complete
- Allergan Oxysept
- Ciba AOSept
- Alcon Opti-one
- Allergan Ultracare
- Bausch & Lomb Renu
- Ciba Quickcare
- Heat disinfection
- Other, please specify_____

Has your eye care professional ever diagnosed you with any of the following:

- Blepharitis
- Giant Papillary Conjunctivitis
- Corneal neovascularization
- Corneal microcysts
- Exposure keratitis
- Solution sensitivity
- Corneal ulcer
- Corneal edema
- Meibomian gland dysfunction

Is your decision to pursue corneal surgery related to (select as many as applicable):

- Contact lens discomfort
- Contact lens vision unsatisfactory
- Contact lens and solution cost
- Desire to be less dependent on contact lenses

What do you perceive to be the advantages of refractive surgery over contact lenses?

_____

_____

_____

If you have never worn contact lenses, please circle any of the following statements which pertain to you:

I have never attempted contact lens correction due to:
(select as many as applicable)

- I have a fear of placing lenses on my eyes.
- I feel that the lens care will be too time consuming for me.
- I lack the motivation, or am just not interested in wearing contact lenses.
- I am reluctant to wear contact lenses because I've heard that they can cause eye problems.
- I have been told I have dry eyes.
- I have allergies, which may preclude any success with contact lenses.
- I have been told I have too much astigmatism.
- My correction is too low for correction with contact lenses.
- I need a distance and near correction.
- I have been told by my eye care professional that I am not a good candidate for contact lenses.
- Contact lenses and care solutions are too expensive for my budget.
  Other, please explain:_____

_____

_____

_____

Occupation. If motivation for refractive surgery is related to occupation, it is important to understand that some employers like law enforcement agencies, state and federal government, the military and airlines may have rules and restrictions.

40 Years and Older. Patients over the age of 40 who are nearsighted, and do not wear corrective lenses for near work, such as reading or using a computer, have another factor to consider. Refractive surgery can provide better distance vision without lenses, but lenses for near work may be required after surgery for people over 40.

Outcome. It is not possible to guarantee or predict exactly the outcome of refractive surgery. However, enhancement procedures may be done up to months later to try and improve the initial results if both the surgeon and patient feel it is warranted.

BIBLIOGRAPHY

1. Hong, J.C., Salz, J.J. Retrospective comparison of photorefractive keratectomy and radial keratotomy. Journal of Refractive Surgery 1995: 11:477-484.

2. Chavez, S., Chayet, A., Celikkol, L., Parker, J., Celikkol, G., Feldman S.T. Analysis of astigmatic keratotomy wit a 5.0mm optical clear zone. American Journal of Ophthalmology. 1996; 121:65-76.

3. Vinger, P.F.: Mieler, W.F.: Oesreicher, J.H.: Easterbrook, M. Ruptured gloves following radial and hexagonal keratotomy surgery. Archives of Ophthalmology 1996: 114:129-134.

4. Krueger, R.R.: Saedy, N.F.; McDonnel P.J. Clinical analysis of steep central islands after excimer laser photorefractive keratectomy. Archives of Ophthalmology 1996; 114:337-381.

5. Florakis, G.J.; Jewelewicz, D.A.; Fan, N.I.; Trokel, S.L. Night vision testing in unoperated eyes. Journal of Refractive Surgery 1996; 12:311-312.

6. Geull, J.L.; Manero F.: Muller, A. Transverse keratotomy to correct high corneal astigmatism after cataract surgery. Journal of Cataract and Refractive Surgery 1996; 22:331-336.

7. Frueh, B.E.; Bohnke, M. Endothelial changes following refractive surgery. Journal of Cataract and Refractive Surgery 1996; 22: 490-496.

8. Mandava, Nl.; Donnenfeld, E.D.; Owens, P.L.; Kelly, S.E.; Haight, D.H. Ocular deviation following excimer laser photorefractive keratectomy. Journal of Cataract and Refractive Surgery. 1996; 22:504-505.

9. Schmitt, Bernard; Villain, M.; Beaufrer, L.; Arnaud B. Bilateral ocular blast injury after refractive surgery by 2 current techniques. A comparative anatomoclinical analysis of a case. Journal of Ophthalmology. 1996; 19:287-291.

10. Buzard, K.S.; Fundigsland, B.R.; Friedlander, M. Transient central corneal steepening after radial keratotomy. Journal of Refractive Surgery. 1996; 12:520-524.

11. Petroll, W.M.; Roy,P; Chuong, CJ.; Hall, B; Cavanagh, H.D.; Jester, J.V. Measurement of surgically induced corneal deformations using three-dimensional confocal microscopy. Cornea. 1996: 15:154-164.

12. Grimmett, M.R.; Holland, E.J. Complications of small clear-zone radial keratotomy. Ophthalmology. 1996; 103:1348-1356.

13. Corbett, M.C.; O'Bart, D.P.; Warburton, F.G.; Marshall, J. Ophthalmology. 1996:103:1381-1391.

14. Waring; Rashid. Major Review: complications of Radial and Transverse Keratotomy. Survey of Ophthalmology. 1989; 34:2.

15. Basuk; Zisman; Waring; Wilson; Binder; Thompson. Complications of hexagonal keratotomy. American Journal of Ophthalmology 1994; 37.

16. American Academy of Ophthalmology-refractive surgery. http:www.eyenet.org/public/ref surg/ref surg.html

17. American Academy of Ophthalmology-Home Page. http://www.eyenet.org/aao index.html.

18. Navy Preliminary Results of PRK on 30 Navy Seals. http://ac088.nhrc.navy.mil/Pubs/Abstract/95/11.html

19. Army PRK Trial Planning Meeting. http://chipmunk.apgea.army.mil/depm/vcp/afonet/newsletr/jun96/a17jun96.htm

20. Department of Defense/Air Force Position paper of PRK. http://chipmunk.apgea.army.mil/depm/vcp/afopnet/newsletr/jun96/a16jun96.htm

21. Patient Satisfaction Survey. Http://www.slackinc.com/eye/jrs/vol132/bensir.htm

22. Eyeworld-Patient Survey Shows High PRK Satisfaction. Http://www.eyeworld.org/march/patienturvey61.html.

23. I Know Why Refractive Surgeons Wear Glasses. Http://members.aol.com/eyeknowwhy

24. What is PRK? American Academy of Ophthalmology. Webmaster@aao.org

25. Photorefractive Keratectomy (PRK) International Society of Refractive Surgery. http://www.isrs.org

26. Refractive Surgery. Mitchell Albers, 1997

27. A Subjective Comparison of Unilateral Photorefractive Keratectomy vs. Daily Disposable Soft Contact Lenses. Sandra Gross; Stacy Harrison. 1997

28. Refractive Surgery. Bradley Nielson, 1997

29. Refractive Surgery. Jennifer Grigsby, 1997

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I grew up in Page, Arizona, where I attended K-12. After high school graduation, I served a two-year mission in Wisconsin for The Church of Jesus Christ of Latter-day Saints. Following my mission I attended Brigham Young University, where I earned a B.S. in Zoology in 1995. While at BYU, I competed in Track and Field for four years running the hurdles and sprint relays. I was conference champion in 1994 in the 400 meter hurdles. I have coached the sprinters and hurdlers on Pacific's Track and Field team for two years while in optometry school. I have been married for four and a half years (Jamie) and have a son (Dakota) and daughter (Cassidy).

BRAD NIELSON

I was born December 17,1970 in Cardston Alberta Canada, where I graduated from high school. I then attended Brigham Young University and earned a B.S. in Zoology in 1995. I always wanted to run hurdles, but was never fast enough and therefore never attained the title "hurdler." I served a two-year mission for The Church of Jesus Christ of Latter-day Saints in Southern California, during which time I learned the Mandarin Chinese language. I am currently married to my wife Amy, and we have two daughters, Amber (3) and Haley (1).