

# Cataract and Refractive Surgery in ; a Survey of KSCRS Members From 1995 ~ 2006

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**Purpose:** This purpose of this report was to study trends in cataract and refractive surgeries conducted during the past twelve years and to compare results to previous reports from the ASCRS and New Zealand (NZ) in order to forecast future medical services.

**Methods:** We surveyed members of the Korean Society of Cataract and Refractive Surgery (KSCRS) every year from 1995 to 2006, and studied changes in cataract and refractive surgeries (RS).

**Results:** The duration of hospitalization has been gradually decreasing to the point that a one day hospitalization following surgery has become common. The rate of topical anesthesia use has significantly increased since 1998. Sutureless incision methods are now commonly practiced. The use of acryl IOL as an optic material has been gradually increasing for cataract surgeries. KSCRS members showed an interest in the special intraocular lenses as multifocal IOL. While Excimer laser PRK was the most popular refractive surgery during the first stage, KSCRS members increasingly prefer LASIK to the Excimer laser PRK. Regression of the corrected visual acuity, dry eye, night halo, and flashes were the most common complications following refractive surgeries. Medical disputes related to PRK and LASIK have been gradually increasing throughout the study period.

**Conclusions:** We confirm that the KSCRS practice styles for cataract and RS are similar to those of the ASCRS and NZ. We infer a world-wide trend from the comparison of these three societies.

*Korean J Ophthalmol* 2009;23:142-147 © 2009 by the Korean Ophthalmological Society.

**Key Words:** Cataract surgery, KSCRS, Refractive surgery, Survey

Cataract and refractive surgeries have been rapidly developing and are the most commonly practiced in the field of ophthalmology. In light of these facts, this survey was conducted in an attempt to understand the current trends of cataract and refractive surgeries and to compare the results to related reports from America and New Zealand in an attempt to forecast future medical services.

This study was conducted by surveying members of the Korean Society of Cataract and Refractive Surgery (KSCRS) every year from 1995 to 2006.<sup>1-11</sup> In America, Dr. Leaming<sup>12-16</sup> has conducted a similar survey of the members of the American Society of Cataract and Refractive Surgery every year since 1985 for a variety of subjects related to ophthalmology. Current data from Leaming's study is available, with results available through the World Wide Web. In New Zealand, surveys on cataract and refractive surgeries have been conducted every three

years since 1997.<sup>17-19</sup>

The aims of this study are to understand trends in cataract and refractive surgeries over the past 12 years and to provide basic information on improved surgical methods and improvements in medical equipment and systems.

## Materials and Methods

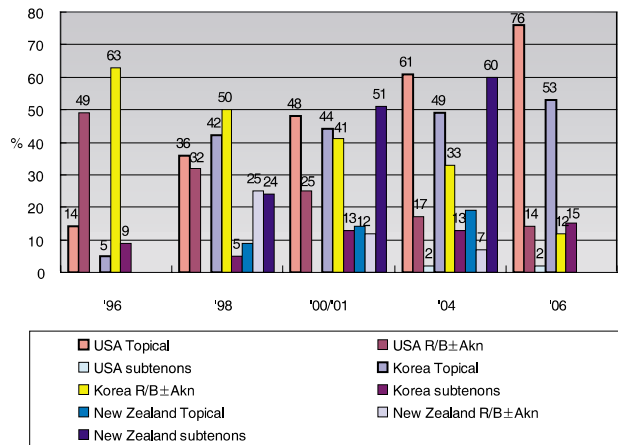
The questionnaire used for this study was composed of multiple-choice questions related to ophthalmology. The number of questions in the questionnaire has increased every year from sixty-two original questions in 1995 to 128 questions in 2006. These 128 questions have the following distribution: seventy-two questions regarding cataract surgery, forty-nine for refractive surgery, and seven for other procedures. The format of the questionnaire is very similar to that used in America for ease of comparison.

The multiple-choice questionnaire, including a reply envelope, was sent to every member of the KSCRS in February. Responding members of the KSCRS were not financially reimbursed. Although the membership of the KSCRS has increased from 150 in 1995 to 348 members in 2006, the survey response rate has decreased every year from a high of 40% in 1995 to 21.0% in 2006. Questionnaires arriving by a March deadline of were analyzed for that year. Each questionnaire was analyzed and the total number of questionnaires for that

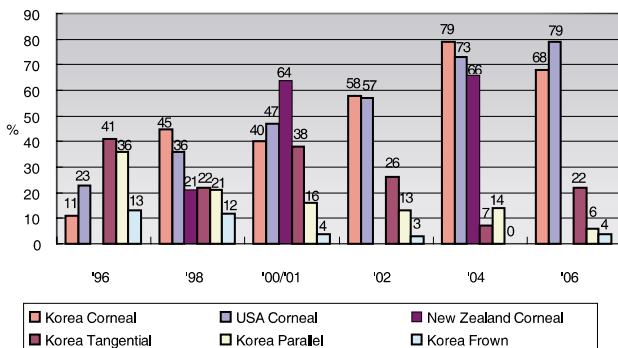
*Received:* May 30, 2008 *Accepted:* August 6, 2009

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\* Presented in part at the XXV Congress of the ESCRS, Stockholm, Sweden, September, 2007



**Fig. 1.** Preferred methods of anesthesia for cataract operations (There were no data about subtenons anesthesia for 1996, 1998, and 2000 in the USA). R/B=Retrolbulbar anesthesia; Akn: Akinesia; Topical=Topical anesthesia.



**Fig. 2.** Preferred surface contour of wounds in phacoemulsification.

year was recorded. New questions were analyzed separately.

## Results

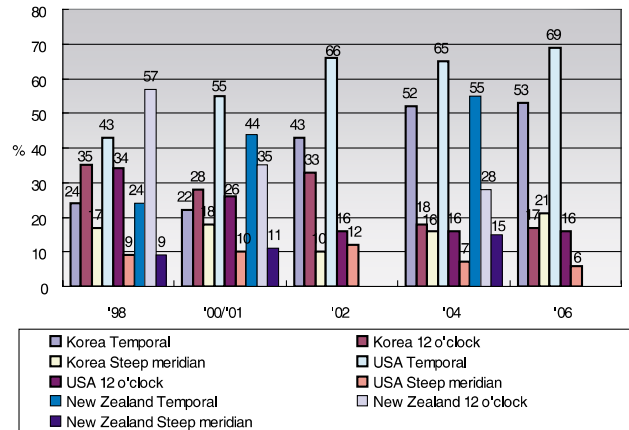
### I. Cataract surgery

#### Age of doctors and the number of cataract surgeries

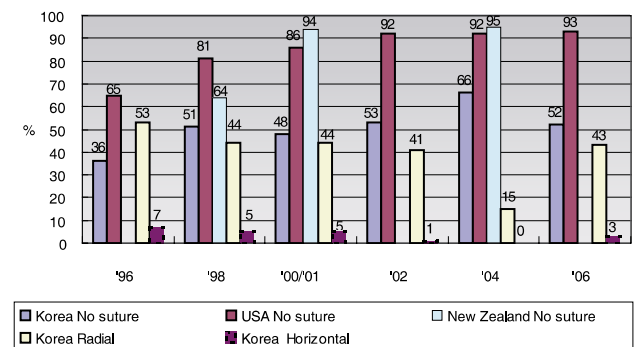
More than 50% of the members who responded to the questionnaire were between 40 and 49 years of age. Twenty-five percent of responders were between 30 and 39 years of age. These figures have been remained similar during the past twelve years. The number of doctors who performed an average of 6-15, 16-25, and 26-50 cataract surgeries per month were each 25% of the total number of doctors. There was no significant increase in the number of surgeries performed per doctor during the past twelve years.

#### Doctors' experience in cataract surgery

The doctors who were most experienced in cataract surgeries had fifteen years of experience. Only 20% of the total number of doctors who performed cataract surgeries in 1995 had over eight years of experience in phacoemulsification; percentage has been increasing to 42% in 1999 and to 61% in 2006.



**Fig. 3.** Incision modes in phacoemulsification.



**Fig. 4.** Wound closure techniques in phacoemulsification.

### Duration of hospitalization

The number of days of hospitalization related to cataract surgeries has decreased with many patients experiencing no hospitalization. While only 22% of the cataract surgery patients left the hospital without hospitalization in 1996, this figure has increased significantly to 31% in 2002 and to 50% in 2006. The rate of hospitalization stays less than one day represented 92% of the total hospitalization rate in 2006.

### Method of anesthesia for cataract surgery

In 1996, more than 50% of the respondents to the survey utilized Nadbath akinesia and retrolbulbar anesthesia concurrently; this figure decreased to 12% in 2006. The rate of topical anesthesia significantly increased from 5% in 1996 to 40% in 1998 and 53% in 2006 (Fig. 1).

### Methods of cataract surgery

For phacoemulsification, most patients preferred a small incision with the size of the incision in 34% of the patients being less than 3.5 mm in 1995 this increased to a rate of 99% in 2006. The incision size in nearly 61% of the cases greater than 5.5 mm in 1996 this decreased to 26% in 1998 and to 0% in 2006. It is noteworthy that micro-incision cataract surgery (MICS), with an incision size of less than 3.0 mm, increased rapidly after 2005 to 28% in 2006. Clear corneal incision has been increasing significantly in phacoemulsification since 1998

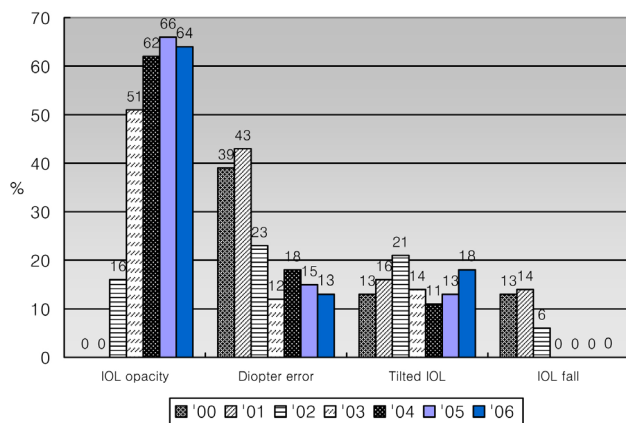


Fig. 5. Causes of IOL removal.

and peaked at a rate of 79% in 2004 this decreased to 68% in 2006 (Fig. 2). The rate of temporal incisions has been increasing for corneoscleral incisions. The 12 o'clock direction incision has been declining in use while the meridian incision, which has a large corneal curvature, has been increasing in use since 2002 (Fig. 3). The sutureless incision method has increased from a rate of 33% in 1995 to 48% in 2000 and to 66% in 2004 this rate as the most common method. However, after 2004, the use of the one radial suture method has risen from 15% in 2004 to 43% in 2006 (Fig. 4).

#### Pediatric cataract surgery

From 2003 to 2006, we added questions related to pediatric cataract surgeries to the questionnaires. Nearly 90% of the doctors reported that they performed pediatric cataract surgeries less than ten times per year. More than 67% of doctors used hypermetropia as the target refraction for children under five years of age. However, more than 50% of doctors used emetropia as the target refraction for children over five years of age. The scleral tunnel incision was the most popular incision method for pediatric cataract surgeries with nearly 60% of doctors using this method. More than 50% of the doctors used acrylic as the optic material for an intraocular lens while nearly 12% of doctors used PMMA (polymethylmethacrylate).

#### Complications resulting from cataract surgeries

Approximately 40% of patients had experienced removal of an intraocular lens during the most recent year this figure has remained constant every year surveyed. Irregular lens power was the most common problem between 1999 and 2002. More than 60% of problems were from IOL opacifications after 2004 (Fig. 5). Nearly 88% of the respondents in 2005 said that the probability of a complication following cataract surgery was 15%, while 58% of the respondents in 2006 said that the probability had declined to 10%. When asked about the timing for YAG laser surgeries, nearly 70% of the doctors reported that they performed YAG surgeries when patients complained about problems that resulted from cataract surgeries.

#### Intraocular lenses

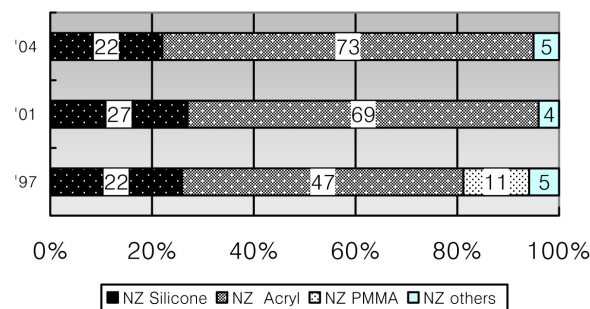
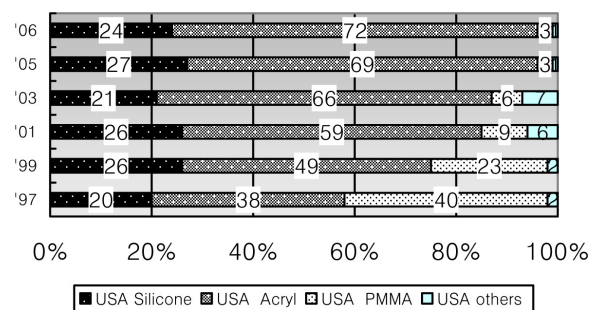
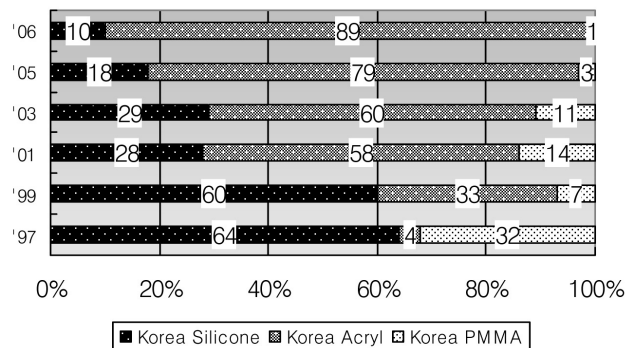


Fig. 6. Preferred materials for small optic IOL.

The use of acryl IOL as the material for intraocular lenses in cataract surgeries performed through small-incisions has been gradually increasing. The use of silicon and PMMA IOL has been decreasing gradually since 1998. The use of acryl IOL increased from 11% in 1998 to 89% in 2006, while the use of silicon lenses decreased from 64% in 1997 to 10% in 2006 (Fig. 6). The most popular size for the optical part of the intraocular lenses used in phacoemulsification was between 5.5 mm and 6 mm. According to survey responses, the acryl IOL was more popular as the future-use material than other materials. Some doctors demonstrated interest in special intraocular lenses, such as multifocal IOL, toric IOL, and accommodable IOL (Table 1).

## II. Excimer laser refractive surgery

Since 2002, most doctors have preferred the 8.5 mm diameter flap for LASIK surgeries. Although they preferred 160  $\mu$ m thick corneal flaps to 130  $\mu$ m flaps from 2001 to 2003, the preference reversed starting in 2004, with 79% of doctors using 130  $\mu$ m

**Table 1.** Interest in specialized intraocular lenses (20002/2003/2004/2005/2006) (%)

	High	Upper normal	normal	Lower normal	Low
Multifocal	8/11/5/15/27	33/39/22/38/34	43/38/47/35/30	2/1/19/11/0	13/3/2/1/9
Toric	5/8/11/7/16	30/23/32/44/33	43/45/34/33/36	7/6/14/14/4	15/10/2/2/11
Phakic	21/23/34/32/51	40/31/32/40/18	30/34/25/22/22	0/2/9/7/0	9/2/0/0/8
Accommodable	22/16/21/24/26	43/37/39/38/38	33/33/28/33/29	2/1/5/5/0	0/3/0/0/6

**Table 2.** Preferred refractive surgeries, according to diopter range (%)

Diopter	Refractive surgery	1998/1999	2001	2004	2006
-3D	KOR PRK	-	21	13	13
	KOR LASIK	-	76	61	68
	KOR LASEK	-	3	17	19
	USA PRK	13	3	8	-
	USA LASIK	70	81	83	-
	USA LASEK	-	2	4	-
	NZ PRK (-4D)	75	35	6	-
	NZ LASIK (-4D)	13	56	76	-
	NZ LASEK (-4D)	-	-	18	-
-7D	KOR PRK	-	6	4	4
	KOR LASIK	-	83	70	70
	KOR LASEK	-	4	18	26
	USA PRK	7	1	3	-
	USA LASIK	92	90	87	-
	USA LASEK	-	2	4	-
	NZ PRK	31	0	0	-
	NZ LASIK	57	88	82	-
	NZ LASEK	-	-	6	-
-12D	KOR LASIK	-	55	6	3
	KOR LASEK	-	8	3	0
	KOR phakic IOL	-	0	59	76
	USA LASIK	59	27	10	
	USA LASEK	-	2	2	
	USA phakic IOL	6	13	37	
	NZ LASIK	62	23	6	
	NZ LASEK	-	-	0	
	NZ phakic IOL	0	9	72	

flaps in 2006. LASIK was the most popular surgery among PRK, LASIK, and LASEK surgeries. When asked about the preferred refractive surgery according to the diopter of myopic patients, LASIK was the most popular surgical method for myopia patients whose diopter was below -12 from 1998 to 2006 in both Korea and the USA. Preference for PRK decreased, but LASEK preference increased, when the myopia was more severe. For myopia with a diopter greater than 12, LASIK was the most popular surgery prior to 2001. LASIK or clear lens extraction use has been decreasing since 2002, while phakic IOL implantation increased to 37% in 2004 in the USA and to 76% in 2006 in Korea (Table 2). Since first including the Wavefront analyzer in the survey in 2002, the number of Wavefront analyzer users has increased from 17% in 2002 to 67% in 2006 in Korea. In the USA, the number of Wavefront analyzer users also increased, from 10% in 2002 to 59% in 2006. The proportion of Wavefront analyzer users was greatest in

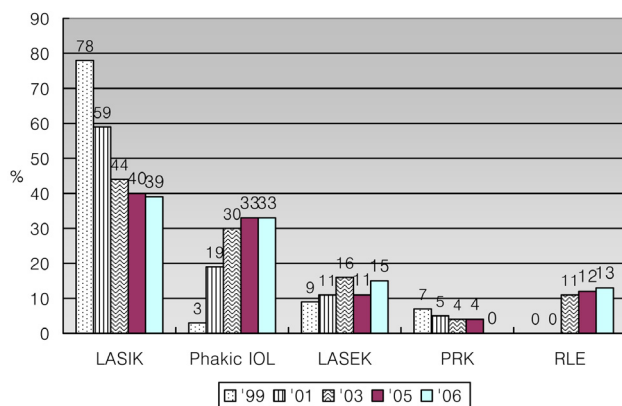
New Zealand with a rate of 94% in 2004. When asked if Wavefront ablation improved vision, 54% of Korean doctors reported that it did..

LASIK is still the most popular refractive surgery, although its popularity significantly decreased from 78% in 1999 to 39% in 2006. Meanwhile, phakic IOL implantation has been gradually increasing in popularity from 3% in 1999 to 33% in 2006 (Fig. 7).

#### Complications from refractive surgeries

We investigated the complication distribution of refractive surgeries and recorded the frequency and morbidity of the complications these included thin or perforated flap formation, free cap formation, dry eye, epithelial ingrowth, and diffuse lamellar keratitis.

The most common complication following PRK surgery up until 2005 was regression of the best corrected visual acuity,



**Fig. 7.** The most promising refractive surgeries. RLE: Refractive Lens Exchange.

representing more than 30% of complications. However, this rate decreased dramatically in 2006. Additionally, all complications of PRK decreased in 2006, though the presence of a halo or glare remained at more than 30%. Nearly 45% of respondents reported that they experienced either thin or perforated flap or free cap formation during the first year following LASIK surgery this figure has remained almost constant every year. Since 2002, nearly 65% of patients experienced dry eye following LASIK surgery, while 55% of patients experienced epithelial ingrowth on the corneal epithelium. Seventy percent of the surgeons reported diffuse lamellar keratitis occurring less than five times annually, while 20% of surgeons reported its occurrence ten to thirty times annually.

#### Legal problems

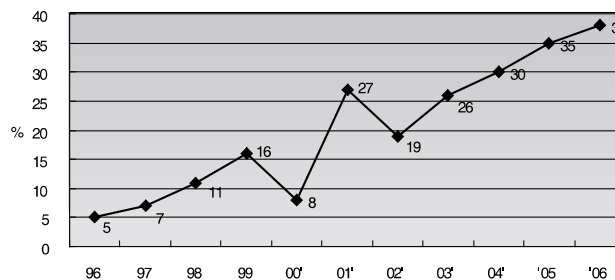
Although there were some fluctuations, medico-legal disputes have been increasing since the start of the survey (Fig. 8).

#### Other responses

When ophthalmologists were asked if they were satisfied with their job, nearly 90% of them said yes in 2001 this figure has decreased to 79% in 2005. Nearly 75% of respondents stated that they would like their children to become ophthalmologists in the future.

### Discussion

By comparing the results from the survey in Korea to those from the USA and New Zealand, we can understand trends and differences among the surgeries. According to these surveys, conducted for eleven years starting in 1995, the number of days hospitalized have been gradually decreasing leaving the hospital within a day of surgery has become common.<sup>1-10</sup> Another identified trend is that the rate of topical anesthesia use has been increasing gradually from 17% in 1997 to 53% in recent years, although this rate is still lower than that found in America, where more than 76% of doctors prefer topical anesthesia. New Zealand ophthalmologists' anesthetic practice differed from Korea's in that the use of topical anesthetic for cataract



**Fig. 8.** Legal problems experienced following cataract and refractive surgeries in Korea.

surgery was low while they preferred a subtenons anesthetic instead.<sup>19</sup>

The results demonstrate that the use of small incisions, from 3.0 mm to 3.5 mm, has significantly increased to 99% for phacoemulsification. This implies that safe surgery is possible with small incisions as operators accumulated more experience and technologies improved. The use of temporal incisions has been increasing for corneal scleral incisions, which is similar to what is found in New Zealand in 2004, but, comparatively lower than in America, which has a rate 69% in 2006 for this technique. Clear corneal incisions increased to a rate of 79% in the USA, 66% in New Zealand, and 68% in Korea according to 2006 surveys. The use of sutureless incisions in phacoemulsification increased significantly until 2004 with 66% of respondents reporting that they utilized it this rate has been decreasing since 2005. Conversely, the one radial suture technique has increased since 2005, an interesting point of difference from other surveys.

Opacity of an intraocular lens was the major cause of removal for intraocular lenses after 2003.<sup>9,10</sup> A hydrophilic acrylic lens was the most popular material used to replace intraocular lenses. This should be further studied by investigating the possible relationship of calcification with hydrophilic acrylic lenses. It is also possible that the increased use of acrylic lenses is reflected in this result.<sup>20</sup> Overall, the use of foldable acrylic IOL as an intraocular lens is on the rise in small incision cataract surgeries.

Although the use of LASIK has been on a gradual decline, it was still the most popular refractive surgery method for myopias with a greater than -12 diopter from 1998 to 2001. However, implantation of phakic IOL has been increasing in Korea, New Zealand, and the USA for myopias with a greater than -12D since 2002.

Wavefront-guided ablation has also been gaining popularity in Korea since 2001. The increase Wavefront analyzer use appears to reflect a greater interest in improving the quality of visual acuity than ever before; however, its effects have yet to meet surgeons' expectations. In the USA, Wavefront-guided ablation decreased somewhat in 2005. One year later, the same change occurred in Korea. This is one example that suggests the practice style for refractive surgery in Korea follows that of the USA.

Among the complications of refractive surgery, regression

of corrected visual acuity, dry eye, night halo, and glare account for a high proportion of total complications.

Legal problems associated with PRK or LASIK were reported more frequently in more recent surveys compared to the early years of the survey.

The questionnaire used for this study has limitations. Most of the questions are multiple-choice questions answers not included in the given choices could not be given. As the survey was done anonymously, tracing those who did not return the questionnaire by the given deadline was impossible. Since the survey was given only to the members of KSCRS and the average responding rate was only 32% during the recent five years, the survey results may not accurately represent the opinions of all ophthalmologists in Korea. Considering that the response rate in America was just 16% in 2005, the Korean survey may be considered to be reflective of the trends of cataract and refractive surgery in Korea. Nevertheless, it was considerably lower than the response rate in New Zealand of 92% in 2004.<sup>19</sup>

In conclusion, many features are common among the three compared societies, such as a decreasing hospitalization period and an increasing use of clear corneal incision and foldable acrylic IOL in cataract operations. In refractive surgery, phakic IOL implantation in high myopia is the most popular method for KSCRS, ASCRS, and New Zealand alike. In broad terms, the KSCRS survey results are similar to those of ASCRS's and New Zealand, and, in our opinion, the KSCRS practice style for cataract and refractive surgeries reflect a world-wide trend. There are differences in New Zealand's survey results, including exceptionally high response rates and a low use of topical anesthesia.

Continuing research and comparisons with the results of other surveys, will likely demonstrate that cataract and refractive surgeries will continue to progress rapidly with changes in techniques and the development and acceptance of new procedures in an attempt to improve surgical outcomes.

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