Cataract Surgery Practice in the Republic of Korea: A Survey of the Korean Society of Cataract and Refractive Surgery 2020

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Purpose: To describe current cataract surgery practice patterns and trends among Korean ophthalmologists.

Methods: A survey was conducted among members of the Korean Society of Cataract and Refractive Surgery in October 2020. Of the 998 questionnaires, 262 (26.3%) were received for analysis. Data were analyzed using descriptive statistics and compared with those of previous surveys.

Results: The largest percentage of respondents (39%) had <5 years of practical experience, and 40% had >11 years of practical experience. The average, median, and mode monthly volumes of cataract surgeries performed by the Korean Society of Cataract and Refractive Surgery members were 31, 20, and 10 cases, respectively. Topical anesthesia was administered by 85% of the respondents. For intraocular lens (IOL) calculations, 96% of the respondents used optical biometry. The proportion of surgeons providing femtosecond laser-assisted cataract surgery increased significantly from 5% in 2018 to 29% in 2020. This increase was accompanied by an increase in the multifocal IOLs. Those who implant multifocal IOL for >10% of their cases increased from 16% (2018) to 29% (2020). Topical nonsteroidal anti-inflammatory drugs were prescribed postoperatively by 76% of the respondents. Most respondents (70%) prescribed these anti-inflammatory drugs for 4 weeks.

Conclusions: This survey provided a comprehensive update on current cataract surgery practice in the Republic of Korea. The results highlighted the increasing use of premium IOLs, femtosecond laser-assisted cataract surgery, optical biometry, and topical anesthesia to better meet the patients’ needs.

Key Words: Biometry, Cataract, Intraocular lenses, Phacoemulsification, Surveys and questionnaires

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Age-related cataracts are the major cause of visual impairment, and cataract extraction is the most frequently performed eye surgery [1]. Surgical techniques, intraocular lenses (IOLs), and phacoemulsification machines have evolved, with improvements in both outcomes and safety [2]. It is important to understand the current patterns of cataract surgery to reveal and reflect the rapidly changing nature of cataract surgery.

Several surveys have been published to describe the ongoing practices and trends of cataract surgery in the USA, New Zealand, Japan, and Canada [3-6]. Current practices and trends of cataract surgery in Korea have been surveyed by the Korean Society of Cataract and Refractive Surgery (KSCRS) since 1995. The latest results are based on a 2018 survey that includes cataract surgical techniques, IOL preferences, and other issues [7-10]. These practices are guided by efficiency, cost, and improved patient-centered care [11,12].

In this study, we analyzed the results of the 2020 KSCRS member survey that asked the type of cataract surgery, type of implanted IOL, surgical procedure, postoperative care, and frequency of complications to provide a comprehensive description of current cataract surgery practice in the Republic of Korea.

Materials and Methods

In October 2020, 51 multiple-choice or open-ended questionnaires were sent via e-mail to 998 KSCRS members. The questionnaire used in this study was based on a previous KSCRS survey, with some modifications to identify the latest and changing surgical trends, such as newly developed types of multifocal IOLs and biometry instruments or femtosecond laser-assisted cataract surgery (FLACS) [7,9]. The questionnaire was organized into four major categories: surgeon demographics, cataract surgery-general, cataract surgery-skill, and related complications. The return questionnaires were not marked or labeled to maintain the confidentiality of the respondent, and no financial reward was offered. This study was approved by the institutional review board of Daejeon St. Mary’s Hospital (DC20QCED0088) and conducted in accordance with the tenets of the Declaration of Helsinki. Informed consent was waived because the study was conducted retrospectively and the analysis used anonymous survey data.

SPSS ver. 17.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analysis.

Results

Surgeon demographics

The response rate was 26.3%. Of the respondents, 84% were males and 16% were females. Survey respondents had cataract surgery experience ranging from <5 years (39%) to >20 years (13%). The largest percentage of respondents (39%) had <5 years of practical experience, and 40% had >11 years of practical experience. Half of the re-

| Characteristics                  | Value         |
|----------------------------------|---------------|
| Age (yr)                         |               |
| 30–39                            | 115 (43.9)    |
| 40–49                            | 95 (36.3)     |
| 50–59                            | 42 (16.0)     |
| 60–69                            | 10 (3.8)      |
| Workplace                        |               |
| Private clinic                   | 133 (50.8)    |
| Public health clinic or military hospital | 1 (0.4)    |
| National hospital                | 4 (1.5)       |
| Eye hospital                     | 39 (14.9)     |
| General hospital                 | 17 (6.2)      |
| University hospital              | 68 (26.0)     |
| Sex                              |               |
| Male : female                    | 221 (84.4) : 41 (15.6) |
| Career of surgical practice (yr) |               |
| ≤5                               | 102 (38.9)    |
| 6–10                             | 56 (21.4)     |
| 11–20                            | 69 (26.3)     |
| >20                              | 35 (13.4)     |
| No. of teammate doctors          |               |
| 1                                | 46 (17.6)     |
| 2–4                              | 98 (37.4)     |
| 5–9                              | 59 (22.5)     |
| ≥10                              | 59 (22.5)     |

Values are presented as number (%).
spondents worked for private clinics (51%), followed by university hospitals (26%), and eye hospitals (15%). The respondents’ demographics are presented in Table 1.

Cataract surgery-general

The average, median, and mode monthly volumes of cataract surgeries performed by the KSCRS members were 31, 20, and 10 cases, respectively. Respondents were asked about the volume of post-refractive cataract surgery. The largest proportion of respondents (67%) performed 1 to 5 post-refractive surgeries per month, 8% performed 6 to 10 surgeries, 4% performed >10 surgeries, and 20% did not perform post-refractive surgery. When asked about performing FLACS, 29% responded that they were using a femtosecond laser. Forty percent of the respondents indicated they were competent in extracapsular cataract extraction. Surgeons were assisted by nursing assistants (32%), nurses (31%), or residents (25%). Surgical instruments were managed and sterilized by nurses (66%) and nursing assistants (33%). The survey asked when they learned about cataract surgery. Resident period was indicated by 43% and board member period by 39%. However, those who had practiced cataract surgery for <5 years responded with the board member period rather than the resident period. When asked about mentoring in cataract surgery, 62% chose their professor, and 25% chose their colleagues.

Biometry for axial length measurements

For IOL calculations, 96% of the respondents used optical biometry. About 73% of the respondents used IOLMaster (Carl Zeiss Meditec, Jena, Germany), 51% used ultrasound A-scan biometry, 18% used AL-scan (Nidek, Gamagori, Japan), and 11% used Lenstar (Haag-Streit, Koeniz, Switzerland). Moreover, 51% used more than one instrument. The most common combination was ultrasound A-scan biometry and IOLMaster (34%).

Anesthesia

Topical anesthesia was used by 85% of the respondents (80% in 2018). Subtenon anesthesia was used by 9% of the respondents (14% in 2018), and retrobulbar block was used by 5% (5% in 2018) (Fig. 1) [7].

Cataract surgery-technique

Temporal clear corneal incisions were used by 59% of the respondents, followed by temporal limbal incision (15%). The temporal site was the preferred incision meridian (74%), and steep-axis incision decreased (Fig. 2). A cataract incision size of 2.8 mm was used by 66% of the respondents (64% in 2018), and a size of 2.2 mm was used by 30% (31% in 2018) [7]. When asked about ophthalmic viscoelastic devices, 1% sodium hyaluronate was used by
68% of the respondents, 1.4% sodium hyaluronate was used by 19%, 2.3% sodium hyaluronate was used by 5%, and a dispersive agent was used by 5%. Of the respondents, 45% used forceps with a cystotome needle for continuous curvilinear capsulorhexis, 17% used a cystotome needle only, and 3% used a femtosecond laser. Capsular polishing was performed by 92% of the respondents during surgery. While 48% of the respondents polished both anterior and posterior capsules, 6% and 31% of the respondents polished only the anterior or posterior capsule, respectively.

IOL use

Since 2001, an acrylic IOL has been the preferred optic material (Fig. 3) [8]. In 2020, 98% of the respondents preferred acrylic and 2% preferred silicone. None of the respondents chose poly (methyl methacrylate). When asked for the toric IOL, 20% of the respondents did not use a toric IOL, and 25% of the respondents used a toric IOL on >10% of their total cataract cases (Fig. 4A). Toric IOLs were implanted more widely in eye hospitals than in private clinics and university hospitals (Fig. 4B). The toric IOL selection mode values were 1 diopter or higher corneal astigmatism in eye hospitals and 1.5 diopters or higher corneal astigmatism in private hospitals and university hospitals (Fig. 4C). The survey asked about the surgical practice patterns regarding use of multifocal IOLs. In 2018, 16% of the respondents implanted multifocal IOL in >10% of their cases. According to a 2020 survey, 29% of the respondents used multifocal IOLs in >10% of their cases (Fig. 5A). Again, multifocal IOLs were more widely used in eye hospitals than in private clinics and university hospitals (Fig. 5B). Further, 64% of the respondents implanted multifocal IOLs in patients who had undergone corneal refrac-
When asked for the mix and match method of multifocal IOL, 54% did not adopt this method, and 27% adopted it in <10% of their patients. Monovision in multifocal IOL patients was addressed in the survey, and respondents answered that they do not perform monovision (68%). The types of preferred toric and multifocal IOLs are shown in Table 2 and 3, respectively.

**Postoperative management**

Thirty-six percent of the respondents did not prescribe oral antibiotics postoperatively, and 44% prescribed oral antibiotics postoperatively for <3 days. Topical nonsteroidal anti-inflammatory drugs (NSAIDs) were prescribed together with topical steroids by 60% of the respondents, and 18% did not prescribe topical NSAIDs. When asked about postoperative eye drops, 70% of the respondents prescribed topical antibiotics and steroids for 1 month, and 15% of the respondents continued to prescribe topical antibiotics and steroids for more than 1 month. Similarly, 58% of the respondents prescribed topical antibiotics and NSAIDs for 1 month postoperatively. Eighteen percent of the respondents completed follow-up visits at 1 month postoperatively, 35% completed visits at 3 months (30% in 2018), 18% completed visits at 6 months, and 25% continued to visit every year. Most respondents (78%) prescribed reading glasses 1 month postoperatively.

**Complications**

Ninety-nine percent of the respondents (94% in 2018) observed posterior capsular rupture during surgery in <5% of cases and 69% in <1% of cases [7]. More than half (53%) of the respondents did not observe patients with postopera-
tive endophthalmitis, 18% observed postoperative endophthalmitis once, and 26% observed postoperative endophthalmitis in one to five cases. More than half (58%) of the respondents reported severe postoperative uveitis.

The occurrences of other complications such as toxic anterior segment syndrome with severe endothelial cell damage, intraocular pressure spikes requiring medication, clinically significant pseudophakic cystoid macular edema (CME), intraocular pressure (IOP) spikes requiring medication, and toxic anterior segment syndrome (TASS) with severe endothelial cell damage are shown in Fig. 6. Overall, these results were comparable with those of a previous survey.

More than half (61%) of the respondents did not observe IOL subluxation or dislocation in uncomplicated cases over the past 10 years, 16% observed this complication once, 19% observed this complication from one to five cases, and 1% observed this complication in 10 cases or more.

**Discussion**

This survey was conducted to summarize the current practice patterns of KSCRS members performing cataract surgery and to describe the changing trends in clinical practice. The questionnaires were based on previous surveys, and some of the questions were revised based on recent surveys. Response rates and numbers increased from 12.7% to 26.3% and from 102 to 262, respectively, compared with that of the previous survey. When asked about the working place of the member, university hospital was the most predominant answer (48%) in the 2018 survey. However, this survey found that more than half of the respondents worked in private clinics (51%), and 26 percent worked in university hospitals. In addition, the percentage of members with <5 years of surgical carriers increased from 26% to 39%. Therefore, different demographic characteristics should be considered when interpreting the results.

The average volume for monthly cataract surgery was comparable to that reported in previous reports from 2018. However, the number of respondents with 6 to 15 cases increased from 18% to 28%, those with 16 to 50 cases decreased from 62% to 49%, and those over 51 cases increased from 11% to 15%. Such a polarization could be explained by the increased participation of new surgeons, increased response from members working in private clinics, and increased activity of members in eye hospitals.

A longitudinal comparison was made for the preferred method of anesthesia, incision location, and IOL materials. Preference for topical anesthesia increased compared to that in previous surveys, reaching 85%. Members chose the temporal side as their preferred incision location. Inter-
Interestingly, the preference for a steep-axis incision decreased. A steep-axis incision is usually chosen to decrease corneal astigmatism. Increased implantation of the toric IOL might be a possible cause of decreased steep-axis incisions. In 2018, 8% of the respondents implanted toric IOL in >10% of their cases. According to a 2020 survey, 25% of the respondents used toric IOLs in >10% of the cases. For the IOL material, nearly all respondents (98%) chose acrylic material. Specifically, 66% of the respondents chose one-piece hydrophobic acrylic, followed by one-piece hydrophilic acrylic (23%).

FLACS has been included in the survey since 2018. The proportion of surgeons providing FLACS increased significantly from 5% to 29%. This increase was accompanied by an increase in multifocal IOLs. Those who implant multifocal IOLs for >10% of their cases increased from 16% in 2018 to 29% in 2020. One notable change is the preferred multifocal IOL. Ranked the 4th multifocal IOL in the 2018 survey, the PanOptix trifocal IOL was the most preferred multifocal IOL for this survey. A survey from the Canadian Ophthalmological Society reported that respondents performing FLACS decreased in 2017 (11.8%) and increased back to 16.9% in 2018 [6,13]. While KSCRS and the Canadian Ophthalmological Society asked if the surgeon was performing FLACS, the American Society of Cataract and Refractive Surgery investigated the percentage of patients receiving FLACS. The 2018 American Society of Cataract and Refractive Surgery survey showed that 10% of cataract patients consulting US surgeons received FLACS [14].

The results of toric and multifocal IOLs were further divided into subgroups by workplace and analyzed. Interestingly, a different pattern was found among the respondents belonging to eye hospitals. The pie graphs showed that both toric and multifocal IOLs were more frequently implanted in eye hospitals than in private clinics or university hospitals (Fig. 4B, 5B). Also, the mode threshold of corneal astigmatism for choosing a toric IOL was lower in surgeons in eye hospitals (Fig. 4C). These results suggest that surgeons in eye hospitals are more active in correcting astigmatism and presbyopia. We prepared a table for the preferred toric or multifocal IOLs obtained from the respondents’ multiple responses. Of note, when interpreting the table, the rate is not the IOL volume implanted in patients, but the response rate from the respondents.

The survey asked about the instruments used for biome-try. Optical biometry was again the mainstream method for axial length measurements. Optical biometry was adopted by 96% of the respondents and ultrasound biomicroscopy by 51% of the respondents. For example, the use of IOL-Master increased from 56% in 2012 to 72% in 2020. Optical biometry has almost replaced conventional ultrasound A-scan biomicroscopy and appears to be the primary tool to measure axial length. Optical biometry using partial coherence laser interferometry can measure axial length with an error of only 0.03 mm [15-17].

The results also confirmed that NSAID eye drops were prescribed by 76% of the respondents postoperatively with or without corticosteroids, and the majority (70%) prescribed eye drops for 4 weeks. This practice pattern was comparable to the COS report, which showed that 77.5% of the respondents prescribed NSAIDs and 50.7% prescribed eye drops for 4 weeks [6].

The limitations of this study should be addressed. First, response bias could have affected the results, although there were few open-ended questions. The questionnaire primarily involved multiple-choice questions without the option of keying in responses that were not listed. Second, the results may fall short of representing the true current cataract surgical trends of KSCRS members. Although the response rate was higher than that in the previous survey (12.7% in 2018), more participation is required to reflect a more comprehensive pattern of practice. The demographic table for age and workplace was summarized between survey respondents and the registered KSCRS members (Supplemental Table 1, 2). The response rates were different among workgroups: 20.1% (133 / 638) for the private clinics, 66.7% (39 / 57) for eye hospitals, and 30.2% (68 / 225) for university hospitals.

In summary, this study was intended to reflect the overall description of cataract surgery patterns among KSCRS members. It is noteworthy that both the response rate and the number of respondents increased. The results highlighted the increasing role of premium IOLs, FLACS, optical biometry, and topical anesthesia to better meet the patients’ needs. We also found different practice patterns in toric and multifocal IOLs depending on the workplace. Follow-up surveys including FLACS, post-refractive cataract surgery, and premium IOLs are needed to reflect the characteristics of rapidly advancing cataract surgery.
Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Supplemental Material

Supplemental Tables are available from: https://doi.org/10.3341/kjo.2020.0001.

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Supplemental Table 1. Demographics of survey respondents by age and workplace

| Survey respondents | Private clinic | Public health clinic or military hospital | National hospital | Eye hospital | General hospital | University hospital | Others | Total |
|-------------------|---------------|------------------------------------------|-------------------|-------------|------------------|--------------------|--------|-------|
| Age (yr) 30–39    | 41            | 1                                        | 1                 | 21          | 9                | 42                 | 0      | 115   |
|                  | 52            | 0                                        | 2                 | 15          | 6                | 20                 | 0      | 95    |
| 50–59             | 33            | 0                                        | 1                 | 2           | 2                | 4                  | 0      | 42    |
| ≥60               | 7             | 0                                        | 0                 | 1           | 0                | 2                  | 0      | 10    |
| Total             | 133           | 1                                        | 4                 | 39          | 17               | 68                 | 0      | 262   |
**Supplemental Table 2.** Demographics of registered KSCRS members by age and workplace

| KSCRS members | Workplace                  | Total |
|---------------|----------------------------|-------|
|               | Private clinic             |       |
|               | Public health clinic or military hospital |       |
|               | National hospital          |       |
|               | Eye hospital               |       |
|               | General hospital           |       |
|               | University hospital        |       |
|               | Others                     |       |
| Age (yr)      |                           |       |
| 30–39         | 129                        | 13    |
|               | 5                          |       |
|               | 1                          |       |
|               | 22                         |       |
|               | 14                         |       |
|               | 142                        |       |
|               | 13                         |       |
|               | 326                        |       |
| 40–49         | 288                        | 9     |
|               | 2                          |       |
|               | 6                          |       |
|               | 26                         |       |
|               | 17                         |       |
|               | 68                         |       |
|               | 9                          |       |
|               | 416                        |       |
| 50–59         | 171                        | 3     |
|               | 0                          |       |
|               | 1                          |       |
|               | 5                          |       |
|               | 5                          |       |
|               | 10                         |       |
|               | 3                          |       |
|               | 195                        |       |
| ≥60           | 50                         | 2     |
|               | 0                          |       |
|               | 0                          |       |
|               | 4                          |       |
|               | 0                          |       |
|               | 5                          |       |
|               | 2                          |       |
|               | 61                         |       |
| Total         | 638                        | 27    |
|               | 7                          |       |
|               | 8                          |       |
|               | 57                         |       |
|               | 36                         |       |
|               | 225                        |       |
|               | 27                         |       |
|               | 998                        |       |

KSCRS = Korean Society of Cataract and Refractive Surgery.