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Intraoperative Complications of Cataract Surgeries in Iran: 2000-2005 Iranian Cataract Surgery Survey

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Abstract

Purpose: To determine the incidence and determinants of intraoperative complications of cataract surgeries performed in Iran during 2000 to 2005

Methods: The Iranian Cataract Surgery Survey (ICSS) is a retrospective study in which random sampling was done from selected centers. One week per season between 2000 and 2005 was assigned to each center and records of cataract surgeries performed during these weeks were studied to determine the type of surgery, the type of cataract, and intraoperative complications.

Results: A total of 13,409 records of cataract surgery were reviewed. The rate of intraoperative complications was 3.03% [95% confidence interval (CI): 2.5-3.5%]. Intraoperative complications were not significantly correlated with age or gender. The most common complication was posterior capsule rupture (PCR) with a rate of 2.82% (95% CI: 2.2-3.4%) followed by vitreous loss (2.76%; 95% CI: 2.2-3.32%). Subconjunctival hemorrhage and nucleus drop into the vitreous occurred in 0.21% and 0.01% of surgeries, respectively. The risk of intraoperative complications was highest with intracapsular cataract surgery (36.17%) and lowest with phacoemulsification (2.29%). In terms of type of cataract, intraoperative complications were highest with traumatic cataract (12.55%) and lowest with senile cataract (2.77%).

Conclusion: Risk of intraoperative complications is lowest with phacoemulsification compared to other methods of cataract surgery. Cataract surgery in Iran, compared to developed countries, does not suffer much from complications such as PCR and vitreous loss.

Keywords: Complications, Cataract Surgery, Intraoperative

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Introduction

Cataract, as the leading cause of blindness and visual impairment, is responsible for 50% of blindness worldwide.¹ The prevalence of cataract in different populations has been reported between 2.0% and 65%.^{2,3} According to the World Health Organization (WHO), the number of people with treatable cataract blindness will reach 40 million by the year 2020, and the need for cataract surgery will increase three fold.⁴

The Vision 2020 initiative emphasizes that the quality and success rate of cataract surgeries should be increased in order to improve the quality of life.⁵ Since surgery is the only treatment option for cataract and prevention of cataract blindness, reports are indicative of intraoperative complications which can negatively affect the long-term outcome and visual performance of individuals and the goal of achieving quality vision.^{6,7} such complications are seen even with advanced surgical methods and state of the art surgical equipment.^{8,9} Studies have been able to demonstrate significantly lower intraoperative complication rates with phacoemulsification, but even this surgical approach has not completely eliminated the risk.^{10,11} Researches believe the surgical technique per se cannot minimize the rate of intraoperative complication and other factors such as surgeon experience and skill play a role.^{12,13}

The ultimate goal of National Program for Control of Blindness (NPCB) is to reduce global blindness. Minimizing intraoperative complications of cataract surgery is an important step towards eliminating visual impairment caused by such complications. The present report is part of the Iranian Cataract Surgery Survey (ICSS) in which we address the rate of complications associated with cataract surgeries performed between 2000 and 2005 in Iran.

Methods

The ICSS is a retrospective study in which the target population was people who had cataract surgery at one of the cataract surgery centers in Iran between 2000 and 2005. Details of the sampling strategy and methodology have been published elsewhere,¹⁴ and given here only in brief.

Sampling

In Iran, patients presenting at eye care centers (private practices, clinics, and hospitals) who have an indication for cataract surgery are referred to cataract surgery centers. Therefore, data for the ICSS was collected from centers that have active operating rooms for cataract surgery.

First, we identified all active cataract surgery centers throughout the nation and collected basic information. Using the total number of cataract surgeries performed in 2004, we classified these centers as major (more than 1000 surgeries) and minor (fewer than 1000 surgeries).

For data collection, we excluded the first two weeks of the year which coincide with the New Year holidays and allocated a random week per season to each center. Therefore, 4 weeks per year, and a total of 24 weeks between 2000 and 2005 were chosen for each center. All records of cataract surgery performed during the selected weeks were reviewed, and necessary data was extracted by trained physicians.

Data analysis

The rates of intraoperative complications were calculated along with their 95% confidence intervals (CIs) by type of surgery per each year. The determinants of complications were assessed through logistic regression. In calculating the 95% CI and standard errors, the design effect of cluster sampling was considered and adjustments were made. Statistical analyses were done using the SPSS and STATA software.

Results

A total of 13,409 records of people who had cataract surgery during 2000-2005 were reviewed. The mean age of this population was 64.89±14.7 years (range, 1 month to 110 years), and 49.7% were female. The mean age of women and men were 65.46±13.84 years and 64.37±15.4 years, respectively.

0.4%, 50.8%, 47% and 1.9% of surgeries were intracapsular cataract extraction (ICCE), extracapsular cataract extraction (ECCE), phacoemulsification and lensectomy, respectively.

The rate of intraoperative complications during these 6 years was 3.03% (95% CI: 2.54-3.52%), and had no significant

correlation with gender ($P=0.144$) or age ($P=0.283$) (Table 1). After age grouping, however, the highest and lowest rates of complications were found in the 11-40 and 51-60 years old age groups, respectively (Table 1). The prevalence of intraoperative complications by type of complication is presented in table 2. The rate of complications decreased from 3.13% in 2000 to 2.8% in 2005. The changes in the rate of complications per year were not statistically significant ($P=0.257$; $\chi^2=6.54$).

Type of complications

The most common intraoperative complication was posterior capsule rupture (PCR) which was seen in 2.82% (95% CI: 2.2-3.4%) of surgeries. The second most common complication was vitreous loss which occurred in 2.76% (95% CI: 2.2-3.32%); 97.9% of cases with PCR experienced vitreous loss as well. Subconjunctival hemorrhage and nucleus drop into the vitreous were recorded in 0.21% (95% CI: 0.12-0.3%) and 0.01% of cases, respectively. As presented in table 2, nucleus and IOL drop significantly increased with age, while other complications were not significantly correlated with age.

Table 3 summarizes the rate of complications by type of surgery. During the studied period, ICCE showed the highest rates of complications (36.17%), and phacoemulsification had the least

complication rates (2.29%). The odds of intraoperative complications were significantly higher with ICCE than other surgical techniques (OR: 18.2; 95% CI: 7.8-46.3%), and significantly lower with phacoemulsification (OR: 0.62; 95% CI: 0.44-0.83).

Number of complications

Our data indicated that 1.96% (95% CI: 1.6-2.3%) of cataract surgeries were associated with one Intraoperative complication, 1.17% (95% CI: 0.66-1.68%) had two intraoperative complications, and about 0.01% had three intraoperative complications. The number of complications significantly increased with age ($P<0.001$), but had no significant correlation with gender.

Type of cataract

Table 4 demonstrates complications by type of cataract. Intraoperative complications were significantly correlated with type of cataract ($P=0.0062$; $\chi^2=77.88$). Highest rate of complications was found with traumatic cataract (12.55%), and lowest rates for senile cataract (2.77%). The odds of intraoperative complications with congenital cataract was 4 times greater than with other types of cataract ($P=0.014$). In case of senile cataract, the odds were significantly lower (OR: 0.51; 95% CI: 0.33-0.79%). Overall, PCR was the most common complication in all types of cataract.

Table 1. Intraoperative complications of cataract surgery by gender and age

Age	Male		Female		Total	
	n	%	n	%	n	%
10>	86	0	55	7.27 (3.30-11.24)	141	3.50 (1.15-5.84)
11-40	398	7.54 (6.11-8.97)	286	6.64 (4.58-8.71)	684	7.27 (6.42-8.11)
41-50	551	2.72 (0.64-4.81)	463	2.38 (0.041-5.16)*	1014	2.66 (0.57-4.74)
51-60	975	1.85 (0.23-3.46)	1015	1.77 (0.73-2.81)	1990	1.80 (0.76-2.85)
61-70	1986	3.27 (2.80-3.75)	2156	2.46 (1.60-3.32)	4142	2.84 (2.35-3.33)
71-80	2183	3.30 (2.06-4.54)	2174	2.71 (1.62-3.81)	4357	3.02 (2.09-3.96)
80<	497	3.62 (0.16-7.09)	467	4.50 (0.55-8.44)	964	4.05 (0.73-7.36)
Total	6676	3.20 (2.60-3.90)	6616	2.80 (2.10-3.40)	13292	3.03 (2.54-3.52)

* Confidence interval calculated with binomial distribution

Table 2. Type of intraoperative complications of cataract surgery by year

Year	n	Posterior capsular rupture	Suprachoroidal hemorrhage	Choroidal effusion	Vitreous loss	Nucleous drop	IOL drop	Total
		%	%	%	%	%	%	%
2000	1468	3.1	0.00	0.00	3.13	0.00	0.00	3.13 (1.76-4.51)
2001	1663	3.4	0.06	0.00	3.37	0.00	0.00	3.43 (2.01-4.85)
2002	2057	2.1	0.10	0.00	2.10	0.00	0.05	2.24 (1.04-3.43)
2003	2521	3.1	0.16	0.00	2.90	0.00	0.04	3.21 (2.29-4.13)
2004	2847	3.0	0.39	0.11	2.88	0.04	0.04	3.41 (2.65-4.17)
2005	2853	2.4	0.35	0.00	2.45	0.00	0.00	2.8 (2.07-3.54)
Total	13409	2.82	0.21	0.02	2.76	0.01	0.02	3.03

Table 3. Type of intraoperative complications of cataract surgery by surgical technique

	ICCE (0.4%)	ECCE (50.8%)	Ph.E (47%)	Lenectomy (1.9%)	Total (100%)
Posterior capsule rupture	0.0	0.31	0.21	0.90	2.82 (2.2-3.4)
Suprachoroidal hemorrhage	0.00	0.13	0.29	0.40	0.21 (0.12-0.3)
Choroidal effusion	4.26	0.01	0.00	0.00	0.02 (0-0.05)
Vitreous Loss	31.91	3.02	2.01	8.76	2.76 (2.2-3.32)
Nucleus drop	0.00	0.00	0.02	0.00	0.01 (0.002-0.03)*
IOL drop	0.00	0.04	0.00	0.00	0.02 (0.0022-0.07)*

* Confidence interval calculates with binomial distribution
 ICCE: Intracapsular cataract extraction
 ECCE: Extracapsular cataract extraction
 Ph.E: Phacoemulsification cataract surgery

Table 4. Type of intraoperative complications of cataract surgery by type of cataract

	Senile	Developmental	Traumatic	Congenital
Posterior capsule rupture	2.57	2.34	12.55	3.8
Suprachoroidal hemorrhage	0.19	0.47	0	0
Choroidal effusion	0.02	0.47	0	0
Vitreous Loss	2.5	2.34	12.55	3.05
Nucleus drop	0.01	0	0	0
IOL drop	0.03	0	0	0
Total complication	2.77 (2.29- 3.25)	3.27 (- 1- 7.54)	12.55 (1.29-23.81)	3.82 (1.42-6.21)

Type of surgeon

In this study, 19.6% of surgeries were done by ophthalmology residents and the rest by the specialists or university attends. Based on the result of this study, the incidence of postoperative complications of cataract surgery by residents was 4.2%, while this amount was 2.7% by specialists or university attends ($P < 0.001$).

Discussion

Cataract is the most common cause of blindness, and although it is easily treatable with surgery, the procedure may be accompanied by intraoperative or postoperative complications. The main objective of cataract surgery is achieving desirable vision, therefore it is important to avoid complications which may lead to impaired vision.^{15,16} In addition to factors such as type of surgery and patient age, results of cataract surgery can be affected by the skill and experience of the operating ophthalmologist.^{15,16} The advent of new techniques such as phacoemulsification has been associated with decreased rates of complications,¹⁷ but reports indicate that surgeons are still very concerned about intraoperative complications. The present report, as part of the ICSS, concerns the rate and determinants of intraoperative complications of cataract surgery, and it is the first of its kind in Iran.

The overall rate of complications in the present study was 3.03%. Compared to rates reported from other countries, this rate is higher than some and lower than some others, however, differences in available resources make accurate comparisons slightly difficult.¹⁸⁻²⁰

We found that PCR was the most common complication; it was recorded in 2.82% of surgeries, and was associated with vitreous loss in 2.76% of the total surgeries. The rate of PCR has been reported 2.54% in the USA.²¹ In the latter report, Reddy believes PCR is mostly dependant on surgical technique and surgeon experience.²² In another study by Lumme, at the Oulu University Hospital the rate of PCR was 5.4%.²³ A review of 8230 cases of cataract surgery by Chan revealed a RCR rate of 1.9%; the rate in the Chinese, Malaysians, and Indians was 1.8%, 2.0%, and 2.7%,

respectively.²⁴ Considering these figures, the PCR rate in our study was intermediate.

The second most common complication in this study was vitreous loss with a rate of 2.76%; similar observations have been reported by other studies as well.^{12,17,25-30} The importance of this complication lies in its association with postoperative complications such as retinal detachment and visual loss.^{16,27}

Rates reported elsewhere range from 7.65% in India,¹⁵ 6.0% by NPCB^{16,27,31} up to 20.0%.³² Compared to these results, it seems that the rate of vitreous loss in Iran is relatively low, but considering the CIs, rates appear to be close in many cases. For example, Mearza et al reviewed 1,614 surgeries and reported a rate of 2.66%.⁷ The relatively low rate of vitreous loss in Iran can be attributable to the application of modern technology, holding regular surgical courses for ophthalmologists, and extensive training during their 4 year residency.³³

Suprachoroidal hemorrhage was recorded in 0.2% of surgeries; similar to the rate observed by Reddy.²² Although the rate of suprachoroidal hemorrhage is expected to be higher in ECCE, the rate of this complication was 0.13, 0.29, and 0.4 in ECCE, phacoemulsification, and lensectomy, respectively (Table 3). In the study by Obuchowska and Mariak, the rate of massive suprachoroidal hemorrhage during ECCE was 0.28%.³⁴ Eriksson et al compared 23,213 phacoemulsification procedures with 14,352 ECCE procedures and the rate of suprachoroidal hemorrhage was 0.03% and 0.13%, respectively.³⁵ Considering the reported range of 0.05% to 0.3% for this complication, it seems that the rate of suprachoroidal hemorrhage in Iran is relatively higher compared to other complications.³⁶

The rate of choroidal effusion, nucleus drop, and IOL drop was 0.02%, 0.01%, and 0.02%, respectively. However, studies concerning these complications are too few to make proper comparisons.

The rate of intraoperative complications was higher with ICCE (36.0%) than with other surgical methods. However, it must be noted that both the rate of this type of surgery and the number of complications associated with ICCE were low. The higher rate of

complications seen with ICCE can be attributed to larger incision size which can alter the structure of the globe or remove the normal barrier between the anterior and posterior segments and therefore lead to higher risk of intraoperative vitreous Loss, and postoperative complications such as suprachoroidal hemorrhage, retinal detachment, expulsive hemorrhage, and infection. Other studies, in agreement with our findings, are also indicative of higher rates of intraoperative complications with ICCE.^{37,38}

ECCE was the popular surgical choice before the advent of phacoemulsification, and thus literature abounds in reports concerning the visual outcome and intraoperative complications of this procedure.^{34,39,40} We found an intraoperative complication rate of 3.2% with ECCE, and similar to other surgical methods, the rate of PCR was highest. Other reports confirm this finding; Lumme and Laatikainen reported rates of 5.4% and 3.2% for PCR and vitreous loss, respectively.²³ Compared to other reports, the rate of intraoperative complications of ECCE seems to be relatively low.⁴¹⁻⁴³

In recent years, phacoemulsification has been gaining popularity, and similar to other reports, we found very low rates of complications (2.3%) with this technique. Studies suggest that the experience and skill

of the surgeon can enhance the safety and reduce the risk of intraoperative complications. In a study, at New Jersey Medical School where phacoemulsification was done by residents, the rate of PCR and vitreous loss during surgery was 6.7% and 5.4%, respectively.⁹ Our rates were lower for both complications, which is mostly due to better experience of our surgeons compared to residents.

The overall rate of PCR in different reports ranges between 0.4% and 10.0%;^{18,19,44,45} rates below 2.5% are only seen with experienced surgeons.^{21,46,47} The rate of PCR in the present study was 0.21%, which is lower than rates reported from elsewhere. The rate of vitreous loss reported in the literature ranges from 1.3% to 15.0%. Although some of our surgeons were still in the learning curve, our finding of 2.01% is acceptably low.^{20,27-30,44,48}

Conclusion

The rates of intraoperative complications with phacoemulsification were lowest compared to other surgical techniques. It can also be claimed that cataract surgery in Iran is safe, as it is seldom complicated by PCR or vitreous loss.

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