

The Melaka Hospital cataract complications study analysis of 12,992 eyes

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Introduction: As in all surgeries, complications during cataract surgery are unavoidable and cause distress to the surgeon and the patient. This study was conducted to know the factors contributing to complications in our settings, to be able to counsel patients about complications and outcomes and to reduce litigations. **Materials and Methods:** The secondary data analysis was conducted using the National Eye Database from 2007 to 2014. Demographic features, ocular comorbidities, technique of surgery, grade of surgeons, types of intraoperative complications, and reasons for not obtaining good visual acuity following intraoperative complications were studied. Statistics was done using Statistical Package for Social Sciences version 20. **Results:** Out of 12,992 eyes, 6.1% had intraoperative complications. The highest rate of complications was when more trainees (medical officers [MOs] and gazetted specialists) operated. Posterior capsule rupture (PCR) was the most common complication followed by vitreous loss and zonular dehiscence. Those aged below 40 years had more complications ($P < 0.05$), and females had more complications. Ethnicity did not affect complications. Pseudoexfoliation was the only comorbidity causing complications ($P < 0.05$). Phacolytic lenses had 8.118 times the odds of getting intraoperative complications. MOs and gazetted specialists got more complications. Good outcomes were obtained in cases without complications and those operated by specialists. High astigmatism was the main reason for poorer outcomes. **Conclusion:** Intraoperative complications were caused mostly by less experienced doctors and had poorer outcomes. Age below 40 years, females, the presence of pseudoexfoliation and phacolytic lenses had more complications. PCR was the most common complication.

Key words: Associations, cataract complications, outcomes

Cataracts and uncorrected refractive errors are the leading cause of blindness in Malaysia.^[1]

The only treatment modality for cataracts is surgery.^[2-4] As in any surgery, the occurrence of intraoperative complications is unavoidable. Complications can also subject a surgeon or hospital to litigation.

There is currently lack of study on intraoperative complications in Malaysia. We aimed to look at factors that contribute to and are associated with intraoperative complications in our setting and to recommend guidelines to minimize these complications in future. We hope that appropriate counseling of patients would also reduce complaints and legal suits in future.

Materials and Methods

We did an 8-year retrospective analysis of all patients who had intraoperative complications during cataract surgery in Melaka Hospital. Data were obtained from the National Eye Database (NED). Permission to conduct the study was granted by the Medical Research Ethics Committee.

The age, gender, and side of eye operated on were noted. The age groups were divided into <40 years, 41–50 years, 51–60 years, 71–80 years, and above 80 years.

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Ocular comorbidities such as pterygium involving the cornea, corneal opacity, glaucoma, chronic uveitis, and pseudoexfoliation were noted. Lens-related complications such as phacomorphic, phacolytic, and subluxated/dislocated lenses were noted.

The type of cataract surgery done whether Lens aspiration using a Simcoe cannula, extracapsular cataract extraction (ECCE), phacoemulsification (phaco), phaco converted to ECCE or intracapsular cataract extraction (ICCE) was all noted down. Whether the surgery was done alone or in combination with other procedures such as pterygium excision, filtering surgery, vitreoretinal surgery, and penetrating keratoplasty were noted down. The grade of the surgeon doing the surgery whether specialist, gazetted specialist or medical officer (MO) was all noted down. A specialist is one who has been assessed after having passed the postgraduate examination and is found to be able to work independently. A gazetted specialist is one who has passed the postgraduate examination in ophthalmology (MS or FRCS) but has to work under the supervision of a consultant senior specialist. A MO is one who has passed MBBS and has to be supervised by a specialist during surgery.

The types of intraoperative complications such as posterior capsular rupture (PCR) without vitreous loss, PCR with vitreous

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loss, central corneal edema, zonular dehiscence, dropped nucleus, and suprachoroidal hemorrhage were all recorded.

We looked to see if certain demographic features and presence of ocular comorbidities resulted in more complications. We studied the relationship between types of cataract surgery, whether done alone or in combination and the grade of a surgeon operating with the occurrence of an intraoperative complication.

The best-corrected visual acuity at 6 weeks postoperatively was taken. Refractions were done by hospital-based optometrists. The visual acuity was classified into – good vision (6/6–6/12), impaired vision (6/18–6/36), and poor vision (6/60 and worse). The outcome of each of the intraoperative complications was studied.

We analyzed the reasons for not obtaining good visual acuity following intraoperative complications. These included high astigmatism, posterior capsule opacification, cystoid macular edema (CME), endophthalmitis, preexisting ocular comorbidity, corneal decompensation, intraocular lens (IOL) decentration and retinal detachment (RD).

Statistics

The data were analyzed with IBM SPSS Statistics for Windows, Version 20.0 (IBM Corp., Released 2011, Armonk, NY, USA). Global Chi-square and Fisher’s exact tests were used to determine the possible relation between two categorical variables. Logistic regression test was performed to determine the strongest factors between the categorical data. $P < 0.05$ was considered statistically significant.

Results

A total of 12,992 eyes underwent cataract surgery from 2007 to 2014 with 6.1% registering intraoperative complications. Some had >1 intraoperative complication during surgery as shown in Table 1. Due to some missing data, only available data were analyzed in various sections of the study.

Fig. 1 shows the trend of intraoperative complications from the year 2007 to 2014. The highest number of intraoperative complications was recorded in 2013 (18.3%) followed by 13.9% in 2014, The lowest number of intraoperative complications was recorded in 2012 (9.2%).

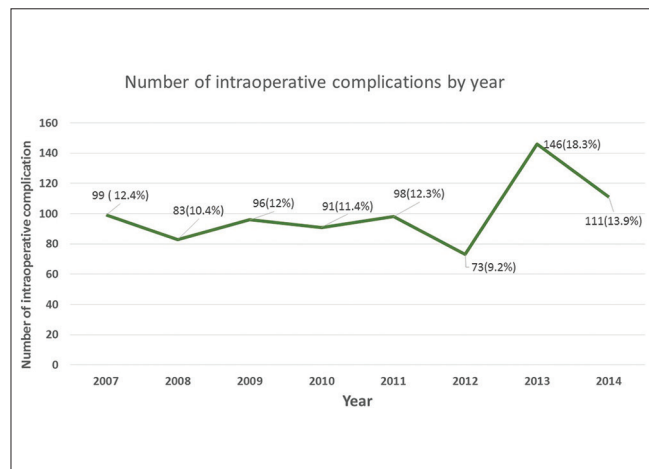


Figure 1: Trend of Intraoperative complications (2007–2014)

Fig. 2 shows that there was a drop in the number of MOs and gazetted specialist handling cataract surgery in 2012 ($n = 190$) with the number doubling in 2013 ($n = 366$).

As seen in Fig. 3, PCR was the main cause of intraoperative complications from 2007 to 2014 with the highest number of cases recorded in 2013 (114 cases). A large number of cases of vitreous loss and zonular dehiscence were also seen from 2007 to 2014. Fewer cases of dropped nucleus, suprachoroidal hemorrhage, and corneal edema occurred during cataract surgery.

Table 2 shows that gender ($P < 0.05$) and age below 40 years old ($P < 0.05$) were significantly associated with intraoperative complications while ethnicity was not significantly associated with intraoperative complications ($P > 0.05$). Females (6.6%) had more intraoperative complications compared to males (5.7%). The highest percentage of intraoperative complications was seen in those aged below 40 years (9.5%) followed by those above 80 years old (6.7%).

Pseudoexfoliation was the only ocular comorbidity significantly associated with intraoperative complications ($P < 0.05$) and accounted for 12.1% of complications from 2007 to 2014 [Table 3].

When adjusted for age group and gender, phacolytic lens, phacomorphic lens, and subluxated lens were noted to have odds of 8.118, 4.494, and 3.212 respectively of acquiring intraoperative complications as compared to other lens ($P < 0.05$) [Table 4].

All types of surgery were significantly associated with intraoperative complications ($P < 0.05$) [Table 5]. ICCE (52.6%)

Table 1: Total intraoperative complications from 2007 to 2014

Intraoperative complication status	Number of eyes	Number of eyes has >1 complication	Percentage
Yes	797	379	6.1
No	12,195	0	93.9
Total	12,992	379	100.0



Figure 2: Number of medical officers/gazetting specialist and Specialists handling cataract surgery

Table 2: Association between sociodemographic status and intraoperative complications

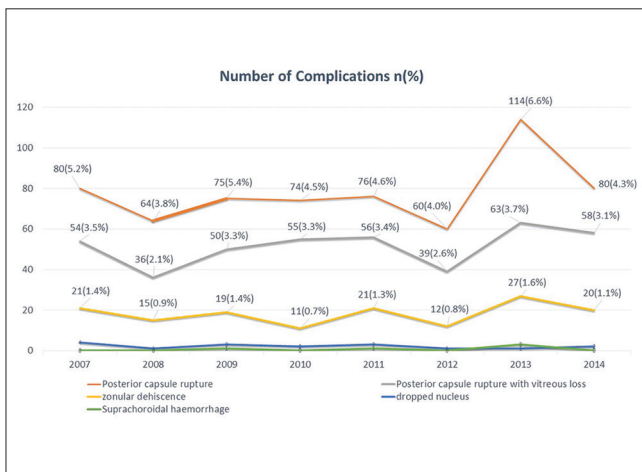
Sociodemographics	Intraoperative complications		OR	χ^2	P
	Yes (%)	No (%)			
Gender	<i>n</i> =797	<i>n</i> =12,194			
Female	405 (6.6)	5705 (93.4)	1.175 (1.018-1.356)	4.878	0.027***
Male	392 (5.7)	6489 (94.3)			
Age	<i>n</i> =797	<i>n</i> =12,191			
Below 40 years old	31 (9.5)	297 (90.5)	1.621 (1.112-2.363)	6.419	0.011***
Between 41 and 50 years old	38 (5.6)	635 (94.4)	1.098 (0.785-1.535)	0.296	0.586
Between 51 and 60 years old	147 (5.7)	2446 (94.3)	1.110 (0.923-1.335)	1.228	0.268
Between 61 and 80 years old	301 (5.8)	4919 (94.2)	1.115 (0.962-1.292)	2.076	0.150
Above 80 years old	280 (6.7)	3894 (93.3)	0.867 (0.746-1.007)	3.491	0.062
Ethnic group	<i>n</i> =789	<i>n</i> =12,084			
Malay	377 (6.1)	5832 (93.9)	1.021 (0.885-1.179)	0.081	0.776
Chinese	320 (6.4)	4643 (93.6)	0.916 (0.792-1.061)	1.368	0.242
Indian	82 (5.1)	1526 (94.9)	1.247 (0.986-1.577)	3.414	0.065

Chi-square, ****P*<0.05 considered significant. OR: Odds ratio

Table 3: Association between sociodemographic status and intraoperative complications

Ocular comorbidities	Intraoperative complication		OR	χ^2	P
	Yes (<i>n</i> =797) (%)	No (<i>n</i> =12,195) (%)			
Pterygium involving the cornea	13 (6.7)	181 (93.3)	1.101 (0.624-1.941)	0.110	0.740
Corneal opacity	10 (10.6)	84 (89.4)	1.832 (0.947-3.543)	3.335	0.068
Glaucoma	48 (5.6)	815 (94.4)	0.895 (0.663-1.208)	0.526	0.468
Chronic uveitis	2 (4.5)	42 (95.5)	0.728 (0.176-3.013)	0.194	1.000
Pseudoexfoliation	18 (12.1)	131 (87.9)	2.128 (1.293-3.501)	9.255	0.002***

Chi-square, ****P*<0.05 considered significant. OR: Odds ratio

**Figure 3: Types of intraoperative complications by year**

and phaco converted to ECCE (50.3%) were the most common techniques of cataract surgeries that caused intraoperative complications followed by lens aspiration (9.9%), ECCE (58.9%), and phaco (4.4%) as shown in Table 5.

Surgeon grade was significantly associated with intraoperative complications. MOs (11.7%) had more intraoperative complications compared to gazetted specialists (10.1%) and specialist (5.1%) as seen in Table 6.

Intraoperative complications were significantly associated with visual outcomes as shown in Table 7. More patients who had intraoperative complications got impaired/poor vision outcome (12.4%). Patients with intraoperative complication had 3.3 times likelihood of having impaired/poor vision outcome compared to patients without intraoperative complication (3.033, 2.554–3.601).

Table 8 shows that there was a significant association between surgeon grade and visual outcomes. It was noted that patients who were operated upon by specialists had 1.25 odds of having good visual outcome as compared to patients who were operated on by gazetted/MOs (*P* < 0.001).

Reasons for not obtaining good acuity were analyzed after excluding the cases with preexisting ocular comorbidities. Fig. 4 shows that high astigmatism (4.9%) was the main reason for not obtaining good visual acuity after surgery. The other reasons were CME (1.3%), corneal decompensation (0.6%), posterior capsular opacity (0.6%), RD (0.3%), infective endophthalmitis (0.1%), and IOL decentration/discoloration (0.1%).

Discussion

In this retrospective study of the NED, we focused on the intra- and post-operative complications of cataract surgery over 8 years in a Malaysian tertiary hospital. Out of 12,992 eyes undergoing cataract surgery, only 6.1% had a variety of intraoperative complications, some of which had >1

Table 4: Association between lens and intraoperative complication by logistic regression

Variable	B	Crude OR (95% CI)	Adjusted OR (95% CI)	P
Phacomorphic lens				
No	0	1	1	
Yes	1.167	3.202 (1.218-8.413)	3.212 (1.220-8.460)	0.018***
Phacolytic lens				
No	0	1	1	
Yes	2.094	8.548 (2.858-25.566)	8.118 (2.707-24.343)	<0.001***
Subluxated/discolated lens				
No	0	1	1	
Yes	1.503	4.986 (2.436-10.207)	4.494 (2.176-9.283)	<0.001***

Adjusted for age and gender. Logistic regression, ***P<0.05 considered significant. OR: Odds ratio, CI: Confidence interval

Table 5: The association between type of cataract surgery and intraoperative complication

Surgery type	Intraoperative complication		OR	χ ²	P
	Yes (n=797) (%)	No (n=121,950) (%)			
ECCE	178 (8.9)	1822 (91.1)	1.637 (1.376-1.948)	31.396	<0.001***
ICCE	41 (52.6)	37 (47.4)	17.821 (11.358-27.961)	293.772	<0.001***
Lens aspiration	16 (9.9)	145 (90.1)	1.703 (1.011-2.868)	4.095	0.043***
Phaco	461 (4.4)	10,036 (95.6)	0.295 (0.255-0.342)	288.326	<0.001***
Phaco converted to ECCE	93 (50.3)	92 (49.7)	16.981 (12.605-22.878)	619.426	<0.001***

Chi-square, ***P<0.05 considered significant. ECCE: Extracapsular cataract extraction, ICCE: Intracapsular cataract extraction, OR: Odds ratio

Table 6: The association between grade of surgeon and intraoperative complication

Surgeon grade	Intraoperative complication		χ ²	P
	Yes (n=788)	No (n=12,133)		
Gazetting specialist	77 (10.1)	682 (89.9)	124.500	<0.001***
Medical officer	176 (11.7)	1322 (88.3)		
Specialist	543 (5.1)	10,177 (94.9)		

Chi-square, ***P<0.05 considered significant

complication. Other centers recorded fewer complications of 1.4%,^[2] 1.9%,^[3] but higher rates than ours were also found (8.5%).^[4]

There was a drop in complications in 2012 followed by a rapid rise in 2013 after which it got back to almost to the usual rate of complications. This trend of complications was seen in the three major types of complications, namely, PCR, vitreous loss, and zonular dehiscence. Throughout the 8 years, the pattern of complications correlated with the increase and decrease in the number gazetting specialists and MOs.

Females and extremes of ages (below 40 years and above 80 years) had more complications. Females and those above 70 were found to have more complications in other studies too.^[2] Complications were not affected by ethnicity.

Pseudoexfoliation was the only ocular comorbidity associated with intraoperative complications. Cataract complications were also higher in cases with pseudoexfoliation in northeast of Spain.^[5] Other studies do not show an association between the presence of pseudoexfoliation and intraoperative complications.^[6] Thanigasalam *et al.* and

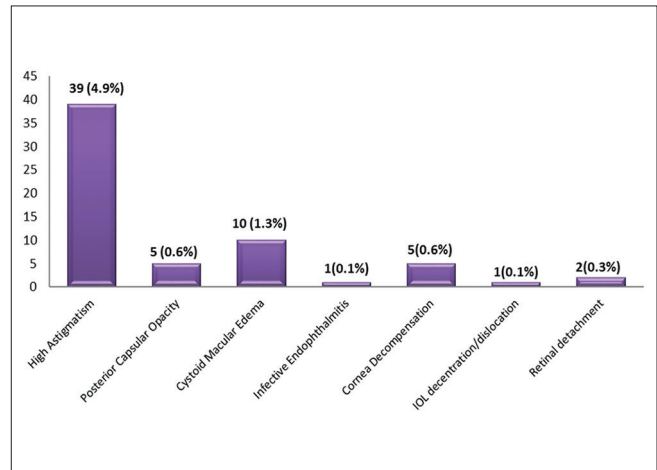


Figure 4: Reasons for not obtaining good visual acuity among patients with intraoperative complications

Sufi found no correlation was found between PCR and the presence of PXM during phacoemulsification.^[7,8] Pterygium involving the cornea, corneal opacity, glaucoma, and chronic uveitis were not associated with intraoperative complications in our study. Pterygium and corneal opacities extending to the visual axis may hamper the view for capsulorhexis and phacoemulsification, but this did not cause an increase in complications. Patients with glaucoma can have raised intraocular pressures if not controlled. Uveitis associated with posterior synechiae and small pupils are also a challenge for the surgeon.

Any sort of abnormal lens status, be it phacomorphic, phacolytic, subluxated, or dislocated lenses, is a nightmare

Table 7: The association between intraoperative complication and visual outcome

Vision outcome	Intraoperative complication		χ^2	OR	P
	Yes (n=634) (%)	No (n=10,360) (%)			
Good	412 (4.5)	8797 (95.5)	174.470	3.033 (2.554-3.601)	<0.001***
Impaired/poor	222 (12.4)	1563 (87.6)			

Chi-square, ***P<0.05 considered significant. OR: Odds ratio

Table 8: The Association between grade of surgeon and visual outcome among cases with intraoperative complications

Surgeon Grade	Visual Outcome		Chi-Square	Odds Ratio	P
	Good n=9199 (%)	Impaired/Poor n=1782 (%)			
Specialist	7655 (84.3)	1424 (15.7)	11.389	1.25 (1.09-1.42)	<0.001***
Gazetting/Medical officer	1544 (81.2)	358 (18.8)			

Chi-square, *** P<0.05 considered significant

for a cataract surgeon. Phacolytic lenses had the highest rate of complications followed by subluxated/dislocated lenses and least of all were the phacomorphic lenses. A point to note is that, after adjusting for age and abnormal status of lenses, we found that men had a higher rate of the odds of getting an intraoperative complication. No significant intraoperative complications were noted during surgery for 74 eyes with phacomorphic lenses.^[9] ECCE or ICCE are the preferred technique for cataract extraction of subluxated lenses in our center. No significant difference in intraoperative complications was found between phaco and manual small incision surgery for subluxated lenses.^[10] We should have perhaps used devices such as capsular tension rings which have been shown to reduce complications for subluxated lenses.^[11,12] Most studies describe the postoperative outcomes of abnormal lens status but not about the intraoperative complications.

We found that all types of cataract surgeries had complications but the highest was for phaco convert to ECCE and the least was for phaco. Phaco convert to ECCE are cases where phaco was commenced, but at some point during the procedure, the surgeon had noticed some abnormality that could lead to further problems. These include a tear or extension of the anterior capsule, a cataract which is found to be hard, a lens which is not stable or even recognition of vitreous in the anterior chamber.

Other studies have also found that the type of cataract surgery was also associated with complications.^[13] However, there are also studies that found no association between the occurrences of intraoperative complications with the type of cataract surgery done.^[14,15] Phaco had the least complications in a number of studies.^[16-18]

MOs had more complications compared to the gazetting specialists who in turn had more complications than the specialists. Complicated cases in our hospital are done by specialists. This shows that more experienced surgeons who had done more cases had fewer complications. This fact is supported by several other studies as well.^[15,19,20] Vitreous loss, dropped nucleus, PCR rates all dropped with increased experience as more cases were done by the same surgeon.^[21] Other studies have disproved this concept as they found that experience of the surgeon did not affect the occurrence of complications.^[13,17]

The data did not have the point of occurrence of the intraoperative complication. This would have been interesting to see if there was a variation in the point at which complications occurred or were recognized. One study showed that consultants got PCR during cortex removal and specialists got it more during segment removal.^[22]

After excluding eyes with preexisting comorbidities, we found that the occurrence of intraoperative complications was detrimental to vision as they resulted in impaired and poor vision. In our study, the grade of the surgeon operating also affected the visual outcomes among the complicated cases. Specialists got good outcomes compared to the gazetting specialists and MOs. The main reasons for the poorer outcomes were high astigmatism, CME, and corneal decompensation. For some patients, the reasons for poor vision were not known. Ocular computed tomography was not available to diagnose subclinical conditions of poor visual outcomes. Most patients with PCR had a favorable visual outcome with meticulous vitrectomy and insertion of a foldable IOL to prevent astigmatism.^[23] In a 5-year audit of PCR, age >65 years, dropped nuclei, and postoperative retinal, corneal, and IOL complications were found to cause poor outcomes.^[24] Poor visual outcomes following vitreous loss were associated with poor preoperative vision, age-related macular degeneration, CME, and anterior PPV for nuclear fragment loss.^[25]

Conclusion

This study involves a large series of patients utilizing the national database. However, the results reflect the practice in only one center and do not reflect the practice patterns and outcomes of the entire nation. Future research should be done using multicenter data.

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Conflicts of interest

There are no conflicts of interest.

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