

The temerloh hospital cataract complications study: factors associated with, types and outcomes of cataract surgery complications

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关于马来西亚医院白内障手术并发症的研究: 相关因素、类型及预后

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摘要

目的:研究白内障手术并发症的发生率及其相关影响因素,包括手术经验、手术类型、麻醉方式和术后视力。

方法:回顾性分析在马来西亚地区医院行白内障手术逾2a的患者。查看病人基本信息、手术类型、麻醉方式和医生手术经验,记录术中和术后的并发症以及术后最佳矫正视力。

结果:在1007名行白内障手术的患者中,并发症发生率为11.1%,其中以囊破裂最为常见(3.6%)。术中医生的手术经验及麻醉方式对并发症的发生不存在影响。白内障囊内摘除术(ICCE)、白内障超声乳化吸除术失败后转为白内障囊外摘除术(ECCE),均是白内障并发症发生密切相关的两种手术方式($P<0.001$),并且发生并发症的患者术后视力均不理想($P<0.001$)。

结论:术中并发症的发生可显著影响术后视力,并与手术方式密切相关,但与医生手术经验和麻醉方式无关。建议今后行白内障囊内摘除术、白内障超声乳化吸除术失败后转为白内障囊外摘除术时,需格外注意并发症的发生,以期减少术后不良视力发生的可能性。

关键词:白内障;白内障超声乳化吸除术;白内障囊外摘除术;并发症;术后视力

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Abstract

• **AIM:** To study the prevalence of complications of cataract surgery and any association between the occurrence of complications and experience of surgeon, type of surgery, type of anaesthesia and visual outcome.

• **METHODS:** This was a retrospective study of patients who underwent cataract surgery over a period of two years in a district hospital in Malaysia. The demographic details of patients, type of surgery done, as well as type of anaesthesia used and experience of the surgeon were noted. The types of intraoperative and postoperative complications were recorded. The final best corrected visual outcome was recorded.

• **RESULTS:** Complications occurred in 11.1% of the total 1007 patients operated. Posterior capsule rupture (3.6%) was the most common complication. The experience of the surgeon and the type of anaesthesia used did not affect complications during surgery. Intracapsular cataract extraction (ICCE) and phacoemulsification converted to extracapsular cataract extraction (ECCE) were significantly associated with more complications ($P<0.001$). The visual outcome was significantly poor in patients with complications ($P<0.001$).

• **CONCLUSION:** The occurrence of complications during cataract surgery significantly affected the visual outcome. The type of surgery done was associated by the occurrence of complications. However, the experience of the surgeon and the type of anaesthesia used did not affect the occurrence of complications. We recommend that particular attention be given to ICCE and phacoemulsification converted to ECCE to minimise the complications and thereby reducing the chances of poor vision postoperatively.

• **KEYWORDS:** cataract; phacoemulsification; extracapsular cataract extraction; complications; visual outcome

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INTRODUCTION

Cataract is a leading cause of blindness in Malaysia^[1] and is the commonest type of ocular surgery performed^[2]. As life expectancy increases, the aging population will increase and the number of patients requiring to undergo cataract surgery will also increase. Cataract surgery has evolved and undergone transition from intracapsular cataract extraction (ICCE), to extracapsular cataract extraction (ECCE) and phacoemulsification. Nowadays, most of the patients demand for phacoemulsification which reduces both the operating and recovery times, paving the way for day care surgery^[3].

Temerloh Hospital is a district hospital in the state of Pahang in Malaysia. It has general ophthalmology services as well as services by subspecialty visiting ophthalmologists (glaucoma and retina). The ophthalmology service is provided by one senior specialist-comprehensive ophthalmologist, two visiting specialists of glaucoma and retina, two gazetted specialists and three medical officers. In Ministry of Health Malaysia, a senior specialist is one who has been gazetted to work independently as a specialist and has more than five years experience. Visiting ophthalmologist is one who has been trained in a subspecialty like cornea, glaucoma, retina *etc.* (after working for few years as comprehensive ophthalmologist) and working independently providing service in state hospital eye department. A gazetted specialist is one who is under the supervision of a senior specialist after passing the postgraduate examination. A medical officer is one who has not passed postgraduate examination in ophthalmology and may be a postgraduate trainee or doctor working in the department. The occurrence of intraoperative and postoperative complications in cataract surgery are unavoidable, but their frequency depends on the type of surgery and the experience of the surgeon.

There are few papers available in the pubmed searching on the prevalence of individual complications in cataract surgery from Malaysia. However, there is no data available on the prevalence of various complications in cataract surgery from a single centre in this country. Therefore, we reviewed the medical records of all cataract operations performed in Temerloh hospital to study the prevalence of complications of cataract surgery and any association between the occurrence of complications and experience of surgeon, type of surgery and visual outcome.

SUBJECTS AND METHODS

Subjects Adult patients who underwent cataract surgery over a period of two years (2009 and 2010) in a district hospital in Malaysia were included in this study. The age of patients ranged from 39 to 83y. All the three races of Malaysians (Malays, Chinese, Indians) and other races like Portuguese descendants, Indonesians, Bangladeshis, Myanmars, and Cambodians were also included in the study. Patients who had

undergone combined cataract and glaucoma surgery were excluded. None of the patients underwent cataract surgery in both eyes. The informed consent for cataract operation was taken at the time of operation. This study was approved by Hospital ethics committee. The data were collected retrospectively from the hospital case folders.

Methods Factors considered in this study were patient's age, gender, ethnicity, the side of eye operated, the type of operation, experience of the surgeon. The types of intraoperative complications such as posterior capsule rupture with/ without vitreous loss, zonular dehiscence, dropped nucleus/ fragments into vitreous and supra choroidal haemorrhage were noted from the patient's records. Postoperative complications such as endophthalmitis, iris prolapse, wound dehiscence, high intraocular pressure and intraocular lens related were also noted.

Type of cataract surgery [intracapsular cataract extraction (ICCE), extracapsular cataract extraction (ECCE), phacoemulsification, phaco converted to ECCE and lens aspiration] and the type of anaesthesia (local or general) were also compared in relation to complications. Phaco converted to ECCE are those cases where the phacoemulsification process had commenced with the use of the phaco probe but due to some reason (subluxating cataract, recognition of a posterior capsule rupture or vitreous loss, or simply because the surgeon found the cataract to be too dense during surgery) it was converted to ECCE.

The final best corrected visual outcome at last follow-up visit was compared between complicated and uncomplicated surgeries. All refractions were done by hospital based optometrists at 6wk postoperatively or later up to 3mo if they were complicated cases or the refraction needed to be repeated.

Statistical Analysis The data was entered and analysed using SPSS programme version 10.0. Chi-square tests were performed to find out significance between the occurrence of complications and all variables.

RESULTS

Out of the 1007 patients who underwent cataract surgery, 112 (11.1%) had complications. Females (12.1%) had slightly more complications compared to males (10.2%). There was no significant difference in the percentage of complications between races (Malays 11.5%, Chinese 10.2% and Indian 10.2%). Complication rates in right eye (11.9%) and the left eye (10.3%) were almost the same (Table 1).

The complications were divided into intraoperative complications and postoperative complications. Intraoperative complications were posterior capsule rupture (with /without vitreous loss), zonular dehiscence (with /without vitreous loss), vitreous loss (with PCR/zonular dehiscence) and dropped nuclear fragments. The postoperative complications

Table 1 Demographic values ($n=1007$)

Variable	With complication	Without complication	<i>P</i>
Age			
<40a	1 (5.6%)	17 (94.4%)	0.067
41–60a	34 (12.8%)	231 (87.2%)	
61–80a	68 (10.0%)	615 (90.0%)	
>80a	9 (22.0%)	32 (78.0%)	
Gender			
Male	51 (10.2%)	451 (89.8%)	0.303
Female	61 (12.1%)	444 (87.9%)	
Ethnicity			
Malay	75 (11.5%)	576 (88.5%)	0.823
Chinese	23 (10.2%)	202 (89.8%)	
Indians	13 (10.2%)	114 (89.8%)	
Others ^a	1 (25%)	3 (75.0%)	
Side of Eye			
Right	59 (11.9%)	435 (88.1%)	0.348
Left	53 (10.3%)	460 (89.7%)	

^aexcluded in the analysis due to small number.

were divided into short term and long term complications. Short term complications were central corneal oedema, iris prolapse, wound dehiscence and subluxation of IOL. Long term complications were endophthalmitis, subluxation of IOL, cystoid macula odema and retinal detachment.

The major forms of complications were posterior capsule ruptures which occurred in 36 patients (3.6%); out of them 16 cases (1.6%) were without vitreous loss while 20 cases (2.0%) were accompanied by the presence of vitreous in anterior chamber. Zonular dehiscence occurred in 26 cases (2.6%); 15 (1.5%) of them did not have vitreous loss while 11 (1.1%) had vitreous loss. Dropped nucleus occurred in 1(0.1%) patient, central corneal oedema in 11 (1.1%). The other isolated complications are shown in Table 2.

There was a higher rate of complications among patients who were operated by the gazetiting specialists (15.2%), compared to those operated by senior specialists (10.1%) and medical officers (9.7%) (Table3). However, the difference was not statistically significant ($P=0.095$). There were more complications in ICCE (60.0%) and Phaco converted to ECCE (58.7%) compared to Phaco (6.5%) and ECCE (12.0%). There was a significant association between type of surgery and complications ($P<0.001$). The odds ratio for complications in ICCE and Phaco converted to ECCE surgeries compared to Phaco and ECCE surgeries was 16.04 (95% CI 8.98, 28.67). Most patients underwent surgery under local anaesthesia ($n=970$). Although the rate of complications was higher among those who were operated under general anaesthesia (18.9%) compared to local anaesthesia (10.8%), the difference was not statistically significant ($P=0.124$).

Table 2 Complications in cataract surgery ($n=1007$)

Type of complication	No. (%)
Posterior capsule rent	36(3.6)
with vitreous loss	16(1.6)
with vitreous loss	20(2.0)
Zonular dehiscence	26(2.6)
without vitreous loss	15(1.5)
with vitreous loss	11(1.1)
Vitreous loss	31(3.1)
with PCR	20(2.0)
with zonular dehiscence	11(1.1)
Dropped nuclear fragments	1(0.1)
Central corneal edema	11(1.1)
Endophthalmitis	1(0.1)
Iris prolapse	4(0.4)
Wound dehiscence	3(0.3)
Subluxation of IOL	3(0.3)

PCR:posterior capsule rent; IOL:intraocular lens.

Table 3 Complications vs experience of doctor, type of surgery and type of anaesthesia

Variable	With complication	Without complication	<i>P</i>
Experience of doctor			
Senior specialist	63 (10.2%)	565 (89.8%)	0.095
Gazitting specialist	32 (15.2%)	178 (84.8%)	
Medical officer	17 (9.7%)	158 (90.3%)	
Type of surgery			
Phacoemulsification	43 (6.5%)	613 (93.5%)	<0.001
ECCE	35 (12.0%)	256 (88.0%)	
Phaco/ECCE	27 (58.7%)	19 (41.3%)	
ICCE ^a	6 (60.0%)	4 (40.0%)	
Lens aspiration ^a	0 (0%)	9 (100.0%)	
Type of anaesthesia			
Local	105 (10.8%)	865 (89.2%)	0.124
General	7 (18.9%)	30 (81.1%)	

^aexcluded in the analysis due to small number. ECCE; extracapsular cataract extraction; ICCE; intracapsular cataract extraction.

Table 4 Visual outcome in cataract patients ($n=1007$)

Visualoutcome	With complication	Without complication	<i>P</i>
Good (6/6–6/18)	59 (59.0%)	689 (82.0%)	<0.001
Impaired (6/24–6/60)	34 (34.0%)	138 (16.5%)	
Poor (5/60–PL)	7 (7.0%)	13 (1.5%)	

PL: perception of light.

Post operative complications among 36 patients who had posterior capsule rupture included central corneal oedema (1), cystoids macula odema (1), wound dehiscence 1 (2.8%) and subluxation of IOL 2 (6.6%). None of these patients developed rhegmatogenous detachment or endophthalmitis. Among those who had complications, 59 (59%) had good vision, 34 (34%) had impaired vision and 7 (7%) had poor vision (Table 4). The visual outcome was significantly poor in patients with complications than those who did not have ($P<0.001$). The odds ratio for impaired or poor vision among those with complication is 3.17 (95% CI 2.05, 4.90).

DISCUSSION

Some of the patients are well educated and they not only enquire about surgeon's experiences but also look up on the internet to know about updates in medical practice. They demand for phaco surgery with good visual outcome, shorter corneal incision implies fewer complications, less operative trauma, faster visual rehabilitation and better visual outcome^[4]. To stay in practice it is becoming essential to learn the art and science of phacoemulsification as stated by Durrani "We must not succumb to inertia and stay static or else the world will pass by"^[5].

Posterior capsule rupture is the most common intraoperative complication that occurs during cataract surgery. In Temerloh Hospital, a total of 36 out of 1007 patients (3.6%) who underwent cataract surgery patients had PCR (posterior capsule rent), of which occurrence of vitreous loss was in slightly more number of patients (2%) than without vitreous loss (1.6%)

Alexander *et al*^[6] found that 4.1% of eyes that underwent cataract surgery had a posterior capsule rupture at the time of surgery which was similar to the rate of 4.4% reported in the National cataract Surgery Survey of over 100 hospitals in the United Kingdom from 1997 to 1998^[7]. The prevalence of PCR was much less in our study (3.6%) than 19% reported by Ahmad *et al*^[8] in phacoemulsification surgery.

In our study, the mean age of the patients who had posterior capsule rupture was 68.4y and the range was 45 to 58y. There was no association between age and complication. It is apparent from the figure shown in the table 1 that there is an increase in the complication rate as age advances. However, it is not statistically significant ($P = 0.067$). A similar finding of age in patients with PCR was reported from Thailand-69.3y^[9] and from UK-79.7y^[10].

Dropped nucleus (whole or fragments of the nucleus into vitreous) is a dreaded complication which is unique to phacoemulsification. Prolonged surgery increases the inflammation and causes corneal oedema as well as raises intraocular pressure. Although small fragments can be managed conservatively, larger fragments will require pars plana vitrectomy, which is time consuming as well as can cause additional stress to the patient. Apart from that, there is increased risk of glaucoma, retinal breaks and detachment, all of which are sight threatening.

Tajunisah *et al*^[11] from Malaysia reported that hard cataracts, polar cataracts, previously vitrectomized eyes and high myopia were the common predisposing factors to dropped nucleus which happened in 1.84% of phacoemulsification. In our study, dropped nuclear fragments occurred in 1 out of 644 phaco surgeries (0.15%).

The experience of the surgeon is likely to affect the final

outcome in terms of risk of complications associated with cataract surgery. Studies have shown that that in low blind rates the patient were operated by experienced surgeons which contrasted with high blind rates in patients who were operated by surgeons with less experience^[12-15]. In our study, gazetted specialists had a higher rate of complications although the rate is not statistically significant ($P = 0.095$). This could be due to the learning curve of gazetted specialists who were learning phacoemulsification and they are also less experienced in performing surgeries.

Out of the 514 patients who had surgical audit data in Westmed Hospital, Sydney, the complications were numerically higher, but not significantly different ($P = 0.091$) for the 330 trainee operated (6.1%) patients compared with 184 consultant operated (2.7%) patients^[16]. Chakrabathi *et al*^[17] a senior phaco surgeon from India reported 8 consecutive patients who had posterior capsule rent over a period of 36 months from December 2005 to December 2008. Among these patients, 1 had pseudoexfoliation, 1 had a pre-existing cornea scar and 6 were hard cataracts.

Posterior capsule rupture may or may not be accompanied by vitreous loss. Out of 6.7% of our patients with PCR, 1.6% were without vitreous loss and 2.0% were with vitreous loss. During the learning curve, Ali *et al*^[18] had reported vitreous loss in majority of the first 300 phaco cases that they did while Hashmani *et al*^[19] had vitreous loss in all patients. However, Junejo *et al*^[20] reported only 1% of vitreous loss in their series of patients with posterior capsule ruptures.

In our study, higher percentage of complications occurred in cases with intracapsular cataract extraction (ICCE) and in cases where phaco surgery was converted to extracapsular cataract extraction (ECCE). The reason cases were converted to ECCE was due to the fact that there was some difficulty that occurred during surgery. During sculpting, if the cataract was dense, the surgeon converted it to ECCE. If other difficulties arose such as subluxation of the lens, pupil size became smaller during the surgery or intraoperative zonular dialysis was detected, then phaco was converted to ECCE. The moment a PCR was seen, the surgery was converted from phaco to ECCE to prevent further complications happening.

The Iranian Cataract Survey from 2002 to 2005, also showed the highest complication rate among ICCE (36.1%) and lowest with phacoemulsification (2.29%)^[21]. In a comparative study done by Neekhara *et al*^[22], it was found that ECCE had a higher rate of complications (6.5%), compared to small incision cataract surgeries (SICS) and phacoemulsification (9.54%).

Local anaesthesia is used routinely for cataract surgeries in our centre. The preferred mode of anaesthesia is using subtenon, but occasionally retrobulbar anaesthesia is used depending on

the surgeon's preference. Topical anaesthesia is not used. General anaesthesia is used in children, in patients who have hearing impairment or deafness, in one eyed (precious eye) patients, in anxious or uncooperative patients, and in those who request for general anaesthesia. The rate of complications in our series was higher among those operated under general anaesthesia (18.9%) compared to local anaesthesia (10.8%) but this was not statistically significant ($P=0.124$).

By comparing the eyes that had complications with those that did not have complications, we have found the detrimental effects of complications of cataract surgery on the visual outcome. The WHO guidelines for acceptable visual outcomes of cataract surgery state that 80% of patients undergoing cataract surgery should have good visual outcomes (6/6–6/18)^[23]. Out of the 1007 patients, 61 (6.1%) had ocular comorbidities and 946 (93.9%) had no ocular comorbidities. Only one patient among those with ocular comorbidities had PCR and the visual outcome was impaired. Among the patients without ocular comorbidities, 30 had posterior capsule rent. Of these 30 patients, 4 (13.3%) had poor vision outcome, 12 (40%) had impaired vision outcome and 14 (46.7%) had good vision outcome. When the visual outcome in patients with PCR was compared with those without PCR, the odds ratio for poor vision outcome with PCR was 16.17 (95% CI 4.58, 57.14). This means that the risk of poor visual outcome was 16.7 times higher in eyes that had a PCR. Alexander *et al*^[6] found that the odds ratio of 3.8 suggests that in eyes without ocular comorbidity identified preoperatively, the risk of poor visual outcome was 3.8 times higher in eyes that had a PCR. In a study of patients with vitreous loss, who were operated by third year residents in USA, found that 77% had a postoperative best corrected visual acuity of 6/12 or better^[24] and it was concluded that it was concluded that good visual acuity can be achieved after resident cataract surgery complicated by vitreous loss. In our study, 48.1% of patients with vitreous loss achieved a final best corrected visual acuity of 6/18 or better.

Prognostic factors that determined the visual outcome following cataract surgery complicated by vitreous loss were age related macular degeneration, cystoids macula oedema, and secondary pars plana vitrectomy following nuclear fragment loss^[25]. Poor visual loss was independently associated with poor preoperative vision.

Trinavat *et al*^[9] found that poor visual outcome in cases complicated by vitreous loss was associated with incisions requiring more than 2 sutures posterior vitrectomy and subsequent complications. Risk factors for the development of cystoid macula oedema are intraoperative complications including posterior capsule rupture, vitreous loss and vitreous incarceration at the wound and anterior chamber.

Chakrabathi *et al*^[17] did not have any cases of cystoid macula oedema and attributed it to the proper management of posterior capsule rupture minimizing the vitreous loss. In our study, 2.8% of patients who had posterior capsule rupture developed cystoid macula oedema, which was evident by fundus fluorescein angiogram. Mearza *et al*^[10] reported that cystoid macula oedema accounted for 50% of patients who lost one or more lines postoperatively following posterior capsule rupture. In patients with dropped nucleus in the study by Tajunisah *et al*^[11], best corrected visual acuity of 6/6 to 6/12 was achieved in 10 out of 22 eyes. They found that the time interval between initial surgery and vitrectomy as well as the type of intraocular lens used did not affect the visual outcome. In one patient who had a dropped nucleus fragments in the present study, the final best corrected visual acuity was 6/12. Subsequent complications that occurred among 36 patients who had posterior capsule rupture were central cornea oedema, wound dehiscence and cystoid macula oedema 1 each (2.8%), and subluxation of IOL in 2 patients (5.6%). None of these patients developed rhegmatogenous retinal detachment or iris prolapse or endophthalmitis. In a similar group of patients, Trinavat *et al*^[8] reported complications such as secondary glaucoma (4.9%), cystoid macula oedema (2.4%), endophthalmitis (1.6%), rhegmatogenous retinal detachment (1.2%), intraocular lens displacement (1.2%) and corneal decompensation (0.8%).

In our study, a significant association was found between occurrence of complication in cataract surgery and visual outcome ($P<0.001$). Among those without complications, 92.1% had good vision compared to only 59% among those with complications. Also among those with complication a relatively higher percentage had impaired and poor vision compared to those without complications. Hence, complications significantly affect visual outcomes.

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