ORIGINAL RESEARCH

A retrospective analysis of risk factors for posterior capsule rupture in cataract surgeries in a local center

Man Yee Tso, FHKAM (Ophth), Koon-Man Lam, MRCSEd, Alan C. K. Ng, MRCSEd, Woon-Ming Chan, FHKAM (Ophth), Raymond K. K. Tse, FRCOphth
Department of Ophthalmology, Caritas Medical Center, Hong Kong, China.

Correspondence and reprint requests:
Koon-Man Lam, Department of Ophthalmology, Caritas Medical Center, Hong Kong, China.

Abstract

Aim: To analyze the risk factors for posterior capsule rupture in cataract surgeries.
Patients and methods: This retrospective study reviewed 269 eyes undergoing extracapsular cataract extraction and 235 eyes undergoing phacoemulsification at the Department of Ophthalmology, Caritas Medical Center.
Results: The rate of posterior capsule rupture for extracapsular cataract extraction was 3.0%, while the rate for phacoemulsification was 7.7%. Chronic obstructive airway disease was a statistically significant risk factor for posterior capsule rupture in phacoemulsification. Hypertension, diabetes, bleeding disorder, types of anesthesia, theaters chosen for operations (implying different biomicroscopes used), preoperative sedation in patients having regional anesthesia, and surgical experience were not associated with the risk of posterior capsule rupture.
Conclusion: Preoperative improvement in the lung function of patients with chronic obstructive airway disease may reduce the risk of posterior capsule rupture in phacoemulsification.

Key words: *Complications, Extracapsular cataract extraction, Phacoemulsification, Risk factors*

Introduction

The rates of posterior capsule (PC) rupture vary for different institutions, ranging from 3% to 9% for extracapsular cataract extraction (ECCE) and approximately 5% for phacoemulsification.[1-5] This retrospective study aimed to determine the complication rate of PC rupture, expulsive hemorrhage, and retrobulbar hemorrhage, as well as to identify significant risk factors for PC rupture in cataract surgeries performed at the Department of Ophthalmology, Caritas Medical Center. The factors studied included hypertension, diabetes mellitus, chronic obstructive airway disease (COAD), bleeding disorder, operating theater allocation, type of anesthesia (general versus regional), type of preoperative sedation for patients having regional anesthesia, and surgeons' experience. If risk factors for the intraoperative complications can be identified, appropriate action can be implemented to reduce the complication rate. The information gathered can also facilitate preoperative counseling and the choice of the most appropriate surgical technique.

Patients and methods

A retrospective case-control study was performed involving all patients undergoing cataract surgeries performed at the Department of Ophthalmology, Caritas Medical Center. The periods of review were chosen randomly as two 1-month periods, separated by an interval of 5 months in the year 2001. There were no particular characteristics for these periods. Two types of surgical procedure were reviewed, namely ECCE and phacoemulsification. Patients who underwent a second procedure during the same session were excluded.

The operative and hospital records of all eligible patients were manually retrieved and reviewed by a single investigator. The complications studied included PC rupture, expulsive hemorrhage and retrobulbar hemorrhage. Patients who developed these complications intraoperatively or within the initial 48 hours of operation were considered

Table 1. Risk factors studied.	
Factor	**Condition**
Patient factors	Diabetes mellitus
	Hypertension
	Bleeding disorders
	Chronic obstructive airway disease
Surgeon factors	Hong Kong Academy of Medicine Fellow status
Procedural factors	Type of anesthesia: regional or general anesthesia
	Theater allocation
	Type of preoperative sedation for regionally anesthetized patients: no sedation, diazepam, or alprazolam

to be cases, while patients without complications served as controls. We had analyzed a number of variables for hypothesis testing based on results from similar studies.[2-6] The potential risk factors were categorized into patient characteristics, surgeon factors, and procedural factors. The details are listed in **Table 1**. Statistical analysis was performed using the Statistical Package for the Social Sciences. The odds ratio for each risk factor was calculated separately for ECCE and phacoemulsification. A p value of less than 0.05 was considered to be statistically significant.

Results

269 patients undergoing ECCE and 235 undergoing phacoemulsification were reviewed. There were 118 men and 151 women with a mean age of 72 years (range, 38 to 93 years) in the ECCE group. The mean age of the phacoemulsification group was 69 years (range, 29 to 89 years) with 102 men and 133 women. The incidence of PC rupture was 3.0% the in ECCE and 7.7% in the phacoemulsification group. The rate of expulsive hemorrhage was 0.4% in both groups. There was no retrobulbar hemorrhage in either group. The patients, procedure, surgeon characteristics, and complication rates are summarized in **Table 2**. Posterior chamber intraocular lenses were implanted in the bag for all the uncomplicated cases. Of the 8 patients undergoing ECCE with complications, 3 had sulcus and 1 had scleral fixation of the intraocular lens. The remaining 4 patients had anterior chamber intraocular lens implantation. Of the 18 patients undergoing phacoemulsification with complications, 14 had sulcus and 1 had scleral fixation of the intraocular lens. The remaining 3 patients had anterior chamber intraocular lens implantation. The odds ratios of various factors for ECCE and phacoemulsification are summarized in **Table 3**. COAD was the only statistically significant risk factor for PC rupture in phacoemulsification ($p = 0.046$), while surgical experience, hypertension, diabetes, bleeding disorders, operating theater allocation and methods of premedication for patients having regional anesthesia were all found not to be statistically significant.

Discussion

Different centers report different rates of complications and different risk factors for cataract surgeries.[1-5] The rate of PC rupture with or without vitreous loss is approximately 3% to 9% for ECCE,[1-5] while that for phacoemulsification is

Table 2. Complication rates and characteristics of patients undergoing extracapsular cataract extraction (ECCE) and phacoemulsification.		
	ECCE (n = 269)	**Phacoemulsification (n = 235)**
Complication rate (%)		
Posterior capsule rupture	3.0	7.7
Expulsive hemorrhage	0.4	0.4
Retrobulbar hemorrhage	0	0
Systemic disease (%)		
Diabetes mellitus	22.0	30.6
Hypertension	35.3	36.0
Bleeding disorders	8.0	8.1
Chronic obstructive airway disease	6.0	6.0
Operation by Hong Kong Academy of Medicine Fellows (%)	67.7	90.7
Type of anesthesia (%)		
Regional	80.3	90.0
General	19.7	10.0
Operating theater allocation* (%)		
Theater 1	23.4	17.0
Theater 2	40.9	27.5
Day surgery center 1	26.7	55.5
Day surgery center 2	9.0	0
Preoperative sedation (%)		
Nil	28.6	20.8
Diazepam	29.0	30.7
Alprazolam	42.4	48.5

* Operating microscopes: theater 1 — Leica M690; theater 2 — Leica M841; day surgery center 1 — Leica M840; day surgery center 2 — Carl Zeiss, OPMI 6 CFC-XY/S.

Table 3. Risk factors for posterior capsule rupture in extracapsular cataract extraction (ECCE) and phacoemulsification.

Risk factors	95% Confidence interval of odds ratio		p Value	
	ECCE	Phacoemulsification	ECCE	Phacoemulsification
Systemic diseases				
Diabetes mellitus	0.224-5.804	0.059-1.173	0.872	0.066
Hypertension	0.031-2.094	0.303-2.323	0.173	0.736
Bleeding disorders	NA	0.082-5.173	NA	0.682
Chronic obstructive airway disease	NA	1.042-14.888	NA	0.046
Operation by Hong Kong Academy of Medicine Fellows	0.185-3.388	NA	0.751	NA
Type of anesthesia				
Regional	0.143-3.716	0.073-4.587	0.701*	0.601*
General	0.269-6.990	0.218-13.658		
Operating theater allocation				
Theater 1	0.263-18.182	0.283-3.370	0.460	0.967
Theater 2	0.271-4.949	0.731-14.651	0.842	0.102
Day surgery center 1	0.139-2.573	0.155-13.06	0.494	0.133
Day surgery center 2	0.080-5.741	NA	0.723	NA
Preoperative sedation				
Nil	0.069-5.496	0.108-1.208	0.662	0.064
Diazepam	0.109-2.821	0.418-3.657	0.471	0.700
Alprazolam	0.410-12.751	0.596-4.457	0.330	0.337

Abbreviation: NA = not applicable.
* Regional anesthesia compared with general anesthesia.

approximately 5%.[1] Lumme and Laatikainen reported that glaucoma and small pupils are significant risk factors, while diabetes, hypertension, and asthma are not.[3] Chitkara and Smerdon found that diabetes was significant but not glaucoma.[5] The results seem to be highly conflicting. Another study by Abbasoglu et al suggested that surgical experience, hypertension, dense cataract, and glaucoma were significant.[2] Surgeon experience was also found to be important in a study by Aasuri et al.[6]

Our study found the risk of PC rupture in ECCE to be 3.0% while that of phacoemulsification to be 7.7%. Compared with other institutions, the rate for ECCE was lower than average while that for phacoemulsification was higher. The differences might be explained by the selection of patients for ECCE and the surgical experience. However, these factors could not be directly compared with those of other institutions. Among the risk factors studied, only COAD in patients undergoing phacoemulsification was a statistically significant risk factor. This was not an unexpected finding considering the increased vitreous pressure in these patients. Improvement in lung function by preoperative physiotherapy may reduce the risk of PC rupture in these patients.

The operative experience of the surgeon (Hong Kong Academy of Medicine Fellow status), anesthetic technique, theater and microscope used, and use of sedative premedication were all found not to be correlated with the complications of PC rupture in either ECCE or phacoemulsification. Hypertension, bleeding disorder, and diabetes mellitus were also not correlated with this complication. The major limitation of this study was the small sample size. Further studies with a larger sample size and better focus on intraoperative factors may provide more information on this problem. Intraoperative high blood pressure, for example, may pose a greater danger than hypertension under good medical control.

In conclusion, this study demonstrated that COAD is a significant risk factor for posterior capsule rupture in phacoemulsification and we recommend intensive chest physiotherapy and medical consultation to improve lung function before undergoing surgery.

References

1. *Kothari M, Thomas R, Parikh R, Braganza A, Kuriakose T, Muliyil J. The incidence of vitreous loss and visual outcome in patients undergoing cataract surgery in a teaching hospital. Indian J Ophthalmol 2003;51:45-52.*
2. *Abbasoglu OE, Hosal B, Tekelio, Gursel E. Risk factors for vitreous loss in cataract surgery. Eur J Ophthalmol 2000;10: 227-232.*
3. *Lumme P, Laatikainen LT. Risk factors for intraoperative and early postoperative complications in extracapsular cataract surgery. Eur J Ophthalmol 1994;4:151-158.*
4. *Kuchle M, Schonherr U, Dieckmann U. Risk factors for capsular rupture and vitreous loss in extracapsular cataract extraction. The Erlangen Ophthalmology Group. Fortschi Opthalmol 1989;86:417-421.*
5. *Chitkara DK, Smerdon DL. Risk factors, complications and results in extracapsular cataract extraction. J Cataract Refract Surg 1997;23:570-574.*
6. *Aasuri MK, Kompella VB, Majji AB. Risk factors and management of dropped nucleus during phacoemulsification. J Cataract Refract Surg 2001;27:1482-1432.*