Visual Outcome after Cataract Surgery complicated by Posterior Capsule Rupture

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Background: *Posterior capsule rupture is one of the most common intra-operative complications of cataract surgery and may lead to other sequelae that affect visual outcome.*
Objective: *To determine the visual outcome and sequelae at 1 year after cataract surgery complicated by posterior capsule rupture and factors related to poor visual outcome.*
Material and Method: *Retrospective chart reviews of the patients who underwent cataract surgery complicated by posterior capsule rupture in Siriraj Hospital between January 2006 and December 2009 were performed. Data collected included demographic data, underlying systemic diseases, pre-existing ophthalmic diseases, type of cataract, type of operation, vitrectomy methods, type of intraocular lens (IOL) implantation, pre-operative and post-operative visual acuity, subsequent complications and management.*
Results: *There were 525 cases that received cataract surgery complicated by posterior capsule rupture. After excluding 280 cases with the follow-up period of shorter than 1 year, 245 eyes of 242 patients were studied. These comprised 111 males and 131 females. The mean age was 69.3 years, ranged from 40 to 92 years. The mean logarithm of the minimum angle of resolution (logMAR) best-corrected visual acuity (BCVA) at 1 year was 0.43 (median 0.24). The proportion of patients who had BCVA of 0.3 logMAR or better was 64.5%. After excluding eyes with pre-existing diseases, 72.9% got this level of BCVA. Vitrectomy was required in 75.5%; which consisted of anterior vitrectomy (68.6%) and posterior vitrectomy (6.9%). Primary intra-ocular lens insertion was performed in 87.4%, mostly in the ciliary sulcus (75.5%). Subsequent complications occurred in 13.9%, which included secondary glaucoma (4.9%), cystoid macular edema (2.4%), endophthalmitis (1.6%), rhegmatogenous retinal detachment (1.2%), IOL displacement (1.2%), uveitis (1.2%), corneal decompensation (0.8%) and fibrous ingrowth (0.4%). The factors associated with the poor visual outcome worse than 0.3 logMAR were pre-existing ocular diseases, incision requiring more than 2 stitches, posterior vitrectomy and subsequent complications ($p < 0.05$).*
Conclusion: *Most of the patients had favorable visual outcome after cataract surgery complicated by posterior capsule rupture. Meticulous vitrectomy to prevent subsequent complications and foldable IOL insertion to minimize the wound size are recommended.*

Keywords: *Posterior capsule rupture, Cataract surgery*

J Med Assoc Thai 2012; 95 (Suppl. 4): S30-S35
Full text. e-Journal: *http://www.jmat.mat.or.th*

Posterior capsule rupture is one of the most common intra-operative complications of cataract surgery. The incidence varied from 0.9 to 9.9% among many reports[1-12]. The higher incidence was found in training institutes. There was 2.4 % rate of posterior capsule rupture in Siriraj hospital[13].

The upcoming sequelae such as cystoid macular edema, retinal detachment, and endophthalmitis significantly affect visual outcome.

Several studies about posterior capsule rupture have been published. Most of them had a short period of follow-up or had not defined the exact duration of follow-up time. The present study was planned to study the visual outcome of cataract surgery complicated by posterior capsule rupture at 1 year after the surgery, upcoming sequelae and factors associated with poor visual outcome.

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Material and Method

Retrospective chart reviews of the patients who underwent cataract surgery by phacoemulsification or extra-capsular cataract extraction and

encountered intra-operative complication of posterior capsule rupture in Siriraj hospital between January 2006 and December 2009 were performed. Siriraj Institutional Review Board approved the present study.

Data collected included age, sex, laterality, systemic underlying diseases, pre-existing ophthalmic diseases, type of cataract, method of operation, performing surgeon, vitrectomy methods, intraocular lens (IOL) type and size, best corrected visual acuity (BCVA) in logarithm of the minimum angle of resolution (logMAR) at pre-operation, post-operation day 1, 30, 90, 180, 365, post-operative complications and management.

All of the data were recorded in case record forms. Statistical analysis was performed using SPSS version 15.0. Categorical variables were analyzed and described in number and percentage whereas continuous variables were described in mean and standard deviation (SD) or median and range. Chi-square test was used to compare categorical variables. Simple and multiple logistic regression was used to determine the factors associated with poor visual outcome which was defined as BCVA worse than 0.3 logMAR. A p-value of less than 0.05 was considered statistical significant.

Table 1. Demographic data: 245 eyes, 242 patients

Demographic data	Number of eyes	Percent
Laterality		
Right	125	51
Left	120	49
Pre-existing ophthalmic diseases	68	27.8
Closed angle glaucoma	18	7.3
Open angle glaucoma	17	6.9
Previous history of CSME	55	2.0
PDR status post PRP	4	1.6
Wet AMD	4	1.6
Dry AMD	3	1.2
Corneal scar	3	1.2
Pseudoexfoliation syndrome	2	0.8
High Myopia	2	0.8
Post-vitrectomized eye	2	0.8
Corneal decompensation	2	0.8
Uveitis	1	0.4
Type of cataract		
Combined cataract	125	51.0
Nuclear cataract	84	34.3
Mature cataract	25	10.2
Cortical cataract	11	4.5

(CSME =clinically significant macular edema, PDR = proliferative diabetic retinopathy, PRP = panretinal photocoagulation, AMD = age-related macular degeneration)

Results

There were 525 cases who underwent cataract surgery and were complicated by posterior capsule rupture in Siriraj Hospital between January 2006 and December 2009. Two hundred and eighty cases were excluded due to having incomplete data or follow-up time less than 1 year. There were 245 eyes from 242 patients in the present study. One hundred and eleven patients (45%) were male. One hundred and thirty-one patients (55%) were female. The mean (SD) age was 69.3 (9.14), ranged from 40-92 years. Pre-existing systemic diseases was found in 60.9% of the patients which were diabetes mellitus in 14.7%, hypertension in 26.2% and both in 20%. Pre-existing ophthalmic diseases are shown in Table 1. Glaucoma was found in 14.2%, followed by diabetic retinopathy (3.6%) and age-related macular degeneration (2.8%).

The cataract type included combined cataract in 51%, nuclear cataract 34.3%, mature cataract 10.2% and cortical cataract 4.5%. Eighty-seven percent of the patients who underwent phacoemulsification surgery while 12.2% underwent extra-capsular cataract surgery. The operations were performed by staffs in 53.1% and by residents in 46.9%. Anterior vitrectomy was performed in 68.6% and posterior vitrectomy was performed in 6.9% while 24.5% of the eyes did not require vitrectomy. Primary intra-ocular lens (IOL) implantation was performed in 85.7% of the eyes. Secondary IOL implantation was performed in 11% while 3.3% of the eyes were left aphakia. Seventy-three percents of the eyes obtained IOL placing in the ciliary sulcus, 11.4 % got scleral fixation, 11% were placed in the bag and 0.8% were placed in the anterior chamber. Rigid IOL was inserted in 63.7% while the rest (36.3%) obtained foldable IOL implantation. The chosen IOL diameter was smaller than 13.5 mm in 65.8% while the rest (34.2%) was equal to or larger than 13.5 mm. There were 39.6% of the eyes that had the incision requiring more than 2 stitches. The operative data are shown in Table 2.

Post-operative complications were found in 13.9 % of the eyes as shown in Table 3. Secondary glaucoma occurred in 4.9% of eyes. Cystoid macular edema occurred in 2.4% of the the eyes. Endophthalmitis occurred in 1.6 % of the eyes and retinal detachment occurred in 1.2% of the eyes.

Median BCVA at pre-operation was 0.64

Table 2. Details of the operations (245 eyes)

	Number of the eyes	Percent
Operation		
Phacoemulsification	215	87.8
Extracapsular cataract extraction	30	12.2
Surgeon		
Staff	130	53.1
Resident	115	46.9
Vitrectomy		
No	60	24.5
Anterior vitrectomy	168	68.6
Posterior vitrectomy	17	6.9
Implantation		
No	8	3.3
Primary implantation	210	85.7
Secondary implantation	27	11.0
Position of intraocular lens		
No IOL	8	3.3
Anterior chamber	2	0.8
In the bag	27	11.0
In the sulcus	180	73.5
Scleral fixation	28	11.4
Type of intraocular lens		
Rigid	151	63.7
Foldable	86	36.3
Size of intraocular lens		
< 13.5 mm	156	65.8
≥13.5 mm	81	34.2

Table 3. Postoperative complications (245 eyes)

Postoperative complications	Number of the eyes	Percent
Secondary glaucoma	12	4.9
Cystoid macular edema	6	2.4
Endophthalmitis	4	1.6
Retinal detachment	3	1.2
Uveitis	3	1.2
Intraocular lens displacement	3	1.2
Corneal decompensation	2	0.8
Fibrous ingrowth	1	0.4

logMAR (n = 245), at post-operation day 1 was 0.60 logMAR (n = 245), at day 30 was 0.30 logMAR (n = 235), at day 90 was 0.27 logMAR (n = 212) and at day 180 was 0.26 logMAR (n = 213), respectively.

Median BCVA at 1 year (n = 245) was 0.24 logMAR (mean 0.43 logMAR). Details are shown in Fig. 1. There were 64.5% of the eyes having BCVA at 1 year equal to or better than 0.3 logMAR. After excluding the eyes having underlying ophthalmic diseases, 72.9% of theses eyes had BCVA at 1 year equal to or better than 0.3 logMAR.

The factors associated with poor visual outcome (BCVA worse than 0.3 logMAR) from univariated analysis were pre-existing ophthalmic diseases ($p < 0.001$), incision requiring more than 2 stitches ($p < 0.001$), post-operative complications ($p < 0.001$), operation by extra-capsular cataract extraction ($p = 0.001$), mature cataract ($p = 0.002$), posterior vitrectomy ($p = 0.002$), rigid IOL insertion ($p = 0.002$) and size of IOL larger than 13.5 mm ($p = 0.027$), as shown in Table 4.

The factors associated with poor visual outcome (BCVA worse than 0.3 logMAR) from multivariated analysis were pre-existing ophthalmic disease ($p < 0.001$), post-operative complications ($p < 0.001$), incision requiring more than 2 stitches ($p = 0.001$) and posterior vitrectomy ($p = 0.049$), as shown in Table 5.

Discussion

Posterior capsule rupture during cataract surgery may lead to poor visual outcome from subsequent complications. The present study examined the visual outcome after these complicated surgeries in a larger population and a longer duration of follow-up time compared to previous studies.

In the present study, 64.5% of the eyes had BCVA at 1 year equal to or better than 0.3 logMAR. This was comparable to previous studies that got this level of BCVA in 60 to 84.4%[6,7,14]. Pre-existing ophthalmic diseases were found significantly associated to poor visual outcome. After excluding the eyes having ophthalmic underlying diseases, 72.9% of these eyes in the present study had BCVA at 1 year equal to or better than 0.3 logMAR. The patients with pre-existing ophthalmic diseases had less opportunity to gain favorable visual outcome even if they had no intra-operative complications. Posterior capsule rupture might be the precipitating factor that speed the progression of diseases resulting in the poor visual outcome. A comparative study between the patients of the same disease who underwent cataract surgery with and without posterior capsule rupture might give the answer.

Posterior vitrectomy was found significantly related to poor visual outcome. The authors assumed that the cases requiring posterior vitrectomy had more severity than the operation that required only anterior

Table 4. Factors related to poor visual outcome (worse than 0.3 logMAR) from univariated analysis

Factors	Crude OR	95% CI	p-value
Pre-existing ophthalmic diseases	3.614	2.016-6.479	< 0.001
Incision requiring more than 2 stitches	2.738	1.595-4.701	< 0.001
Postoperative complications	4.118	1.923-8.820	< 0.001
Extracapsular cataract extraction	3.734	1.684-8.279	0.001
Mature cataract	3.731	1.572-8.853	0.002
Posterior vitrectomy	4.896	1.664-14.406	0.002
Rigid intraocular lens insertion	2.554	1.383-4.719	0.002
Size of intraocular lens ≥13.5 mm	1.877	1.072-3.285	0.027

(OR = odds ratio, CI = confidence interval)

Table 5. Factors related to poor visual outcome (worse than 0.3 logMAR) from multivariated analysis

Factors	Adjusted OR	95% CI	p-value
Ophthalmic underlying disease	3.508	1.855-6.633	< 0.001
Postoperative complications	4.692	1.999-10.719	< 0.001
Incision requiring more than 2 stitches	2.861	1.573-5.204	0.001
Posterior vitrectomy	3.238	1.004-10.450	0.049

(OR = odds ratio, CI = confidence interval)

Table 6. Proportion of eyes (%) gaining visual acuity of 20/40 or better after cataract surgery complicated by posterior capsule rupture

Series	Time of report	Number of eyes	Duration of follow-up	Overall(%)	Excluding eyes with pre-existing diseases (%)
Mulhern[14]	1995	37	9 months	60.0	-
Yap[4]	2000	44	3-47 months	-	85.7
Ionides[5]	2001	59	N/A	-	82.4
Tan[15]	2002	57	N/A	-	86.0
Chan[6]	2003	142	3 months	70.4	87.0
Ang[7]	2006	45	1-37 weeks	84.4	86.7
Mearza[9]	2009	43	2 months	-	87.0
The present study	2011	245	12 months	64.5	72.9

N/A = not available

vitrectomy.

The operations requiring a large size wound such as extra-capsular cataract extraction and wound extension to remove retained lens material or for rigid IOL insertion might produce a poor visual outcome due to induction of a larger amount of astigmatism.

Post-operative complications were found significantly related to poor visual outcome. The most common post-operative complication in the present study was secondary glaucoma occurring in 4.9% of the eyes. Cystoid macular occurred in 2.4% of the eyes. The study of Tan and Karwatowski also found that cystoid macular edema led to poor visual outcome[15]. The study of Singalavanija and co-authors found that posterior capsule rupture increased the risk of retinal detachment[16]. It occurred in 1.2% in the present study. The authors had not found any risk factors significantly related to post-operative complications.

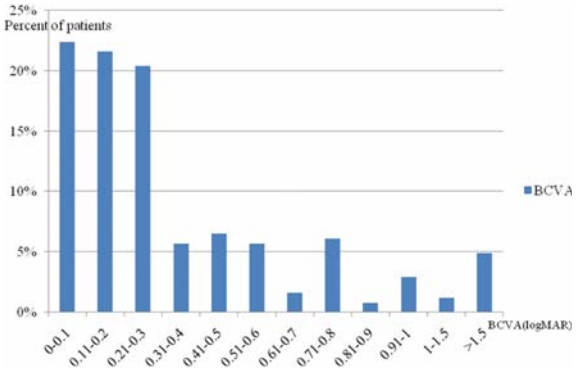

Fig. 1 Bar chart showing proportion of BCVA at 1 year after the operations

The authors found that 2.4% of the eyes had post-operative endophthalmitis. The overall incidence of post-operative endophthalmitis after cataract surgery in Siriraj Hospital was 0.175% between January 2006 and December 2009. Even the present study didn't compare between the posterior capsule rupture group and non posterior capsule rupture group, the authors assumed that posterior capsule rupture increased the risk of post-operative endophthalmitis, due to lack of barrier to prevent pathologic organisms getting access to the posterior segment of the eye.

The present study had a lesser proportion of eyes gaining BCVA better than 0.3 logMAR comparing to the previous studies as shown in Table 6. Thirty-four eyes in the present study had post-operative complications. The median time to development of these complications was 111 (2-365) days. Three eyes that had no post-operative complications at 1 year developed complications, which were retinal detachment at post-operative day 474 in 1 eye, neovascular glaucoma at post-operative day 606 and 799 in 2 eyes respectively. Short-term studies might reveal a better visual outcome than longer-term studies since late complications had not yet developed.

Although most of the patients in the present study had acceptable visual outcome and post-operative complications occurred in small numbers, significant visual loss happened. Early detection and appropriate management is the important issue.

Conclusion

Most of the patients had favorable visual outcome after cataract surgery complicated by posterior capsule rupture. Meticulous vitrectomy to prevent subsequent complications and foldable IOL insertion to minimize the wound size are recommended.

Acknowledgement

The authors wish to thank the Faculty of Medicine Siriraj Hospital, Mahidol University and Miss Supattra Sawangkul for collaboration, Miss Chulaporn Pooliam for statistical analysis.

Potential conflicts of interest

None.

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ผลการมองเห็นภายหลังการผ่าตัดต้อกระจกที่เกิดถุงหุ้มเลนส์ด้านหลังฉีกขาดและปัจจัยที่เกี่ยวข้อง

อดิศักดิ์ ตรีนวรัตน์, นีรุชา วิชัยบุญ

***ภูมิหลัง**: ถุงหุ้มเลนส์ด้านหลังฉีกขาด เป็นภาวะแทรกซ้อนระหว่างการผ่าตัดต้อกระจกที่พบได้บ่อยที่สุดและส่งผลกระทบต่อการมองเห็นหลังการผ่าตัด*

***วัตถุประสงค์**: เพื่อศึกษาผลการมองเห็นหลังการผ่าตัดต้อกระจกที่เกิดถุงหุ้มเลนส์ด้านหลังฉีกขาด และปัจจัยที่มีผลต่อการมองเห็น*

***วัสดุและวิธีการ**: ศึกษาเวชระเบียนย้อนหลังของผู้ป่วยที่ได้รับการผ่าตัดต้อกระจกที่เกิดถุงหุ้มเลนส์ด้านหลังฉีกขาดในโรงพยาบาลศิริราช ตั้งแต่เดือนมกราคม พ.ศ. 2549 ถึง ธันวาคม พ.ศ. 2552 ข้อมูลที่รวบรวมได้แก่ อายุ เพศ ตาข้างที่ทำการผ่าตัด โรคประจำตัว โรคทางตาที่มีอยู่เดิม ชนิดของต้อกระจก ชนิดของการทำผ่าตัด วิธีการตัดน้ำวุ้นตา ชนิดและขนาดของเลนส์ตาเทียม การมองเห็นก่อนและหลังทำการผ่าตัด และปัจจัยต่างๆที่ส่งผลต่อการมองเห็น*

***ผลการศึกษา**: มีผู้ป่วยทั้งหมด 525 ราย ที่ได้รับการผ่าตัดต้อกระจกและเกิดถุงหุ้มเลนส์ด้านหลังฉีกขาด เมื่อคัดผู้ป่วยที่ข้อมูลไม่ครบสมบูรณ์ และ มาตรวจติดตามการรักษาเป็นระยะเวลาน้อยกว่า 1 ปีแล้ว มีผู้ป่วยในการศึกษานี้ทั้งหมด 245 ตา จาก ผู้ป่วย 242 ราย แบ่งเป็นเพศชาย 111 ราย และเป็นเพศหญิง 131 ราย อายุเฉลี่ย 69 ปี ผู้ป่วยร้อยละ 64.5 มีผลการมองเห็นที่ 1 ปีดีกว่า 0.3 logMAR ผู้ป่วยร้อยละ 75.5 ได้รับการตัดน้ำวุ้นตาโดยแบ่งเป็นการตัดน้ำวุ้นตาส่วนหน้าร้อยละ 68.6 และ ตัดน้ำวุ้นตาส่วนหลังร้อยละ 6.9 ผู้ป่วยร้อยละ 87.4 ได้รับการใส่เลนส์เทียมในการผ่าตัดครั้งแรก โดยใส่ในช่องหลังม่านตาร้อยละ 75.5 ผลแทรกซ้อนหลังผ่าตัดเกิดขึ้นร้อยละ 13.9 ประกอบด้วย ต้อหินทุติยภูมิร้อยละ 4.9 จุดรับภาพชัดบวมน้ำร้อยละ 2.4 ติดเชื้อในลูกตาร้อยละ 1.6 จอตาลอกร้อยละ 1.2 เลนส์ตาเทียมเคลื่อนร้อยละ 1.2 ม่านตาอักเสบร้อยละ 1.2 กระจกตาเสื่อมร้อยละ 0.8 พังผืดงอกร้อยละ 0.4 ปัจจัยที่มีผลต่อการมองเห็นที่แย่กว่า 0.3 logMAR ได้แก่ โรคทางตาที่มีอยู่เดิม ผลแทรกซ้อนหลังการผ่าตัด แผลผ่าตัดที่จำเป็นต้องเย็บแผลมากกว่า 2 เข็ม และการตัดน้ำวุ้นตาส่วนหลัง*

***สรุป**: ผู้ป่วยส่วนใหญ่มีผลการมองเห็นหลังการผ่าตัดต้อกระจกที่เกิดถุงหุ้มเลนส์ด้านหลังฉีกขาดอยู่ในระดับที่น่าพอใจ ผู้นิพนธ์แนะนำให้ตัดน้ำวุ้นตาอย่างเหมาะสมเพื่อป้องกันผลแทรกซ้อนหลังผ่าตัด และการใส่เลนส์พับเพื่อให้แผลมีขนาดเล็กเท่าที่สามารถจะทำได้*