Outcomes of Cataract Surgery in Senile Cataract Patients at Siriraj Hospital: A Prospective Observational Study

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The present study was done to assess the results of cataract surgery performed in Siriraj Hospital by comparing phacoemulsification and extracapsular cataract extraction techniques in senile cataract patients within a 3-month period. The prospective observational study of a representative sample of 379 patients(409eyes) who underwent cataract surgery in Siriraj Hospital from January 1, 2004 to March 31, 2004. Identical clinical assessment protocol was used to compare the improvement of postoperative visual acuity and surgical complications between two surgical techniques and different surgeons. Of the 409 eyes, phacoemulsification was performed on 373 eyes (91.2%), and extracapsular cataract extraction was performed on 36 eyes (8.8%). Departmental staff operated on 326 eyes (79.7%) and ophthalmology residents operated on 83 eyes (20.3%). The primary outcome was postoperative visual acuity. Visual acuity was improved $\geq$ 2 Snellen chart lines in 278 of 373 eyes (74.5%) in the phacoemulsification group, and $\geq$ 2 lines in 31 of 36 eyes (86.1%) in the extracapsular cataract extraction group. A small risk of surgical complications was found in the present study. Posterior lens capsule rupture was the most frequent complication found (10/409eyes), followed by corneal injury (9 of 409eyes). Endophthalmitis was the most severe complication in the present study, occurring in 1 of 409 eyes. There was a significant difference in postoperative visual improvement between phacoemulsification and extracapsular cataract extraction techniques. Final visual acuity in the phacoemulsification group was better than in the extracapsular cataract extraction group.

Keywords: *Cataract surgery, Senile cataract, Outcomes of surgery*

J Med Assoc Thai 2005; 88 (Suppl 9): S82-8
Full text. e-Journal: *http://www.medassocthai.org/journal*

Age-related cataracts are the leading cause of visual impairment in adulthood worldwide[1]. Senile cataracts are defined as lens opacities that develop after the age of 50 years. The prevalence of senile cataracts is believed to be increased in climatic zones. Ultraviolet light, especially ultraviolet-B, has been postulated as a factor in the genesis of senile cataracts[2]. Thailand is a climatic country and exposure to sunlight may be associated with the high prevalence of cataract blindness in Thailand. Modern techniques in cataract surgery have been performed in Thailand for nearly 30 years. Phacoemulsification and extracapsular cataract extraction are the most popular surgical techniques for cataract surgery. Innovative techniques in cataract surgery and the well-distributed health care system can reduce the prevalence of cataract blindness in Thailand.

Other than the reduction in prevalence of cataract blindness, the authors are interested in the effectiveness of surgical outcome, especially the change in visual acuity after cataract removal. The present study was designed to study the improvement of vision without glasses and the rate of surgical complications of cataract surgeries performed in Siriraj Hospital during a 3-month period. More than 3,000 cases of cataract patients undergo cataract surgery in Siriraj Hospital per year.

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Material and Method

The present study was approved by the Siriraj Ethical Committee. Data was collected from January 1- March 31, 2004. Senile cataract patients who underwent cataract surgery during this period were selected.

Inclusion Criteria

1. Age ≥ 50 years.
2. Underwent cataract surgery by phacoemulsification or extracapsular cataract extraction during the period of study.
3. Intraocular pressure lower than 20 mmHg, and/or visual field is not less than 30 degrees in case of controlled glaucoma.

Exclusion Criteria

1. History of previous ocular surgery in the same eye.
2. History of eye diseases that may cause visual impairment such as uncontrolled glaucoma, severe NPDR, etc.
3. History of systemic disease that may cause visual impairment, such as uncontrolled diabetes mellitus, cerebrovascular disease, dementia, psychosis.
4. History of drug usage that may cause visual impairment, such as chloroquine, quinine, chlorpromazine, etc.
5. History of ocular genetic disease that may cause visual impairment, such as retinitis pigmentosa, achromatopsia, etc.

A total of 379 patients (409 eyes) were included in the present study. Before surgery, all patients were given a complete eye examination, which included slit-lamp biomicroscopy, tonometry, and fundoscopy. Patients with glaucoma had visual field testing before surgery. The baseline data before surgery was collected as follows:

1. Visual acuity (VA) by Snellen chart
2. Intraocular pressure
3. Other descriptive data such as, age, gender, systemic diseases

When the patients underwent cataract surgery, the following data was collected:

1. Surgeon: Departmental staff or resident
2. Surgical technique: phacoemulsification or extracapsular cataract extraction
3. Complications of surgery

After successful surgery, the patients were given appointments for follow-up at 1 week, 1 month, and 4 months postoperatively. The following data were collected from each follow-up visit:

1. VA by Snellen chart
2. Complications after surgery

The data collection from each patient was concluded 4 months after surgery.

Data analysis

The data were collected and analyzed by the SPSS version 11.5 program. The analysis was focused on 2 fields of interest:

1. Effectiveness of surgery

The authors were interested in the visual improvement after surgery, especially VA without further correction by glasses. The authors believed that patients with good surgical outcome should not need additional correction by glasses for distance vision. In other words, after successful cataract surgery, patients will not need glasses. The present study shows the data and discusses the visual improvement with uncorrected VA.

2. Rate of complications

The authors reported complications of surgery during the intraoperative and postoperative periods. These 2 fields of data were collected and compared between phacoemulsification and extracapsular cataract extraction techniques using t-student and Mann-Whitney U tests.

The difference was statistically significant when P value was < 0.05. Snellen VA data was analyzed after being transformed into the equivalent log MAR scale.

Results

1. Demographic data

A total of 379 patients (409 eyes) were enrolled in the present study. There were 163 male (43%) and 216 female (57%) patients. The average age was 67.69years (median 68 years, range 50-93 years). When comparing the average age among patients, those who underwent extracapsular cataract extraction were older than those who underwent phacoemulsification.

Among 409 eyes, 373 eyes (91.2%) underwent phacoemulsification and 36 eyes (8.8%) underwent extracapsular cataract extraction (Table 1).

2. Baseline data

The baseline uncorrected VA from 409 eyes was distributed as shown in Table 2.

Patients in the phacoemulsification group had a mean Log MAR VA equal to 0.788 (median 0.80, SD 0.436) while those in the extracapsular cataract group had a mean Log MAR VA equal to 1.650 (median 1.90, SD 0.533).

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Table 1. Average age of patients between groups

Surgery	N (eyes)	Mean ± SD (years)	Median (min-max)
Phaco	373	67.50±8.12	68.0 (50-90)
ECCE	36	69.73±10.98	70.0 (50-93)
Total	409	67.69±8.42	68.0 (50-93)

Table 2. Distribution of preoperative VA in each surgical group (phacoemulsification and ECCE)

Preoperative VA	Phacoemulsification	ECCE	Total
6/6	1 (0.3%)	0 (0%)	1 (0.2%)
6/9	18 (4.8%)	0 (0%)	18 (4.4%)
6/12	31 (8.3%)	0 (0%)	31 (7.6%)
6/18	65 (17.4%)	0 (0%)	65 (15.9%)
6/24	70 (18.8%)	2 (5.6%)	72 (17.6%)
6/36	89 (23.9%)	2 (5.6%)	91 (22.2%)
6/60	41 (11.0%)	4 (11.1%)	45 (11.0%)
5/60	6 (1.6%)	0 (0%)	6 (1.5%)
4/60	4 (1.1%)	3 (8.3%)	7 (1.7%)
3/60	10 (2.7%)	1 (2.8%)	11 (2.7%)
2/60	5 (1.3%)	0 (0%)	5 (1.2%)
1/60	7 (1.9%)	1 (2.8%)	8 (2.0%)
Fc	22 (5.9%)	11 (30.6%)	33 (8.1%)
Hm	4 (1.1%)	11 (30.6%)	15 (3.7%)
Pj, Pl	0 (0%)	1 (2.8%)	1 (0.2%)
Total	373 (100%)	36 (100%)	409 (100%)

Table 3. Distribution of postoperative VA in each surgical group (phacoemulsification and ECCE)

Postoperative VA	Phacoemulsification	ECCE	Total
6/6	103 (27.6%)	1 (02.8%)	104 (25.4%)
6/9	97 (26.0%)	2 (5.6%)	99 (24.2%)
6/12	77 (20.6%)	6 (16.7%)	83 (20.3%)
6/18	58 (15.5%)	12 (33.3%)	70 (17.1%)
6/24	20 (5.4%)	9 (25.0%)	29 (7.1%)
6/36	11 (2.9%)	2 (5.6%)	13 (3.2%)
6/60	4 (1.1%)	2 (5.6%)	6 (1.5%)
1/60	1 (0.3%)	0 (0%)	1 (0.2%)
Fc	2 (0.5%)	1 (2.8%)	3 (0.7%)
Hm	0 (0%)	1 (2.8%)	1 (0.2%)
Total	373 (100%)	36 (100%)	409 (100%)

3. Outcome

Postoperative uncorrected final VA at 4 months is shown in Table 3. The authors found that 69.9% of patients had an uncorrected final VA ≥ 6/12, 87% had an uncorrected final VA ≥ 6/18, and 25.4% had an uncorrected final VA 6/6.

Patients in the phacoemulsification group had a final postoperative mean Log MAR VA equal to 0.273 (median 0.20, SD 0.265), while those in the extracapsular cataract extraction group had a mean Log MARVA equal to 0.586 (median 0.50, SD 0.392) (Table 4).

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When the authors compared the improvement of uncorrected VA from the baseline VA of each patient (Table 5), it was found that 74.5% of patients in the phacoemulsification group had improvement of VA $\geq$ 2 Snellen chart lines, and 86.1% of patients in the extracapsular cataract extraction group had improvement of VA $\geq$ 2 Snellen chart lines (Fig. 1).When comparing preoperative and postoperative Log MAR VA of each patient, the mean difference between preoperative and postoperative Log MAR VA after surgery was 0.563 (SD 0.509; 95%CI, 0.214-0.313; P $\leq$ 0.0001) (Table 6).

Patients in the phacoemulsification group had a mean difference between preoperative and postoperative Log MAR VA of 0.515 (SD 0.467, P $\leq$ 0.0001) and those in the extracapsular cataract extraction group had a mean difference between preoperative and postoperative Log MAR VA of 1.064 (SD 0.647, P $\leq$ 0.001).

When the authors compared the mean difference in Log MAR VA between patients in the phacoemulsification group and the extracapsular cataract extraction group by randomizing 36 patients from the phacoemulsification group (Table 7), the mean difference in preoperative and postoperative Log MAR VA in the extracapsular cataract group was greater than in the phacoemulsification group. This means the authors found clinically significant greater improvement of VA from baseline in the extracapsular cataract extraction group compared to the phacoemulsification group (P = 0.004).

When the authors compared the mean difference in preoperative and postoperative Log MAR VA between surgeons (departmental staff or residents) by randomization of 83 patients whose surgeries were performed by the departmental staff (Table 8), the results showed that patients who underwent surgery by staff members had a mean difference in preoperative and postoperative Log MAR VA of 0.465 (SD 0.344) compared to residents (mean difference in preoperative and postoperative Log MAR VA 0.819, SD 0.639).

4. Adverse effects

From the present study, the authors found that 34 eyes (8.3%) had no postoperative visual improvement. They had the same vision as the baseline preoperative VA (Table 4). All of these patients underwent phacoemulsification (9.1%of the phacoemulsification group).Visual acuity worsened in 15 eyes (1.2%); 14/15 eyes underwent phacoemulsification (3.7% of phacoemulsification group) and 1 eye underwent extracapsular cataract extraction (2.8% of extracapsular cataract group). The authors found that 37 eyes (9.04%) had surgical complications (Table 9). Most were minor complications.Ten eyes (2.4%) had a posterior lens

Table 4. Comparison of preoperative and postoperative VA when converted to Log MAR scale

SURGERY		Preop Log MAR	Postop Log MAR
Phaco (373)	Mean $\pm$ SD	0.788$\pm$0.436	0.273$\pm$0.265
	Median (min-max)	0.80 (0-2)	0.20 (0-1.9)
ECCE (36)	Mean $\pm$ SD	1.650$\pm$0.533	0.586$\pm$0.392
	Median (min-max)	1.90 (0.6-3)	0.50 (0-2)
Total (409)	Mean $\pm$ SD	0.864$\pm$0.507	0.301$\pm$0.292
	Median (min-max)	0.80 (0-3)	0.30 (0-2)

Table 5. Comparison of postoperative VA changes to baseline VA of each patient

Improved VA	Phacoemulsification	ECCE	Total
Loss $\geq$ 2 lines	5 (1.3%)	0 (0%)	5 (1.2%)
Loss < 2 lines	9 (2.4%)	1 (2.8%)	10 (2.4%)
Same	34 (9.1%)	0 (0%)	34 (8.3%)
Better < 2 lines	47 (12.6%)	4 (11.1%)	51 (12.5%)
Better $\geq$ 2 lines	278 (74.5%)	31 (86.1%)	309 (75.6%)
Total	373 (100%)	36 (100%)	409 (100%)

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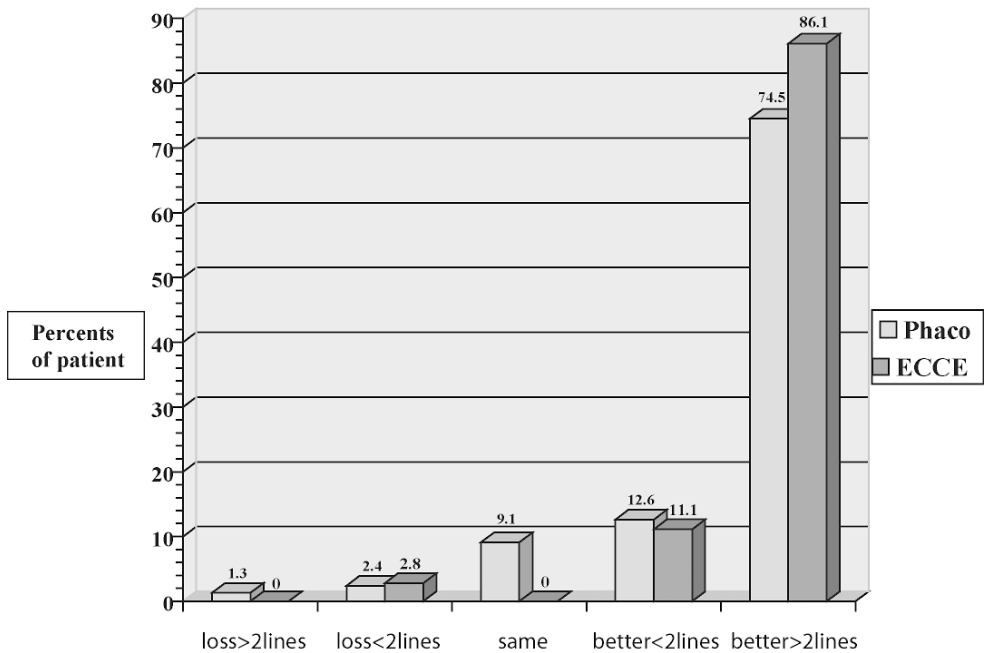

Fig. 1 Change in final VA when compared to baseline VA in each surgical group

Table 6. Mean difference between preoperative and postoperative Log MAR VA of each patient in each surgical group

SURGERY	N	Mean ± SD	Median	Minimum	Maximum
Phaco	373	0.515±0.467	0.50	-0.90	2.00
ECCE	36	1.064±0.647	1.30	-0.10	2.70
Total	409	0.563±0.509	0.50	-0.90	2.70

Table 7. Comparison of mean difference between preoperative and postoperative Log MAR VA of each patient in each surgical group by randomization of 36 patients in the phacoemulsification group

SURGERY	N	Mean ± SD	Median	Minimum	Maximum
Phaco	36	0.694±0.397	0.60	0.00	1.80
ECCE	36	1.064±0.647	1.30	-0.10	2.70
Total	72	0.852±0.574	0.70	-0.10	2.70

Table 8. Comparison of mean difference in preoperative and postoperative Log MAR VA of each patient in each surgical group classified by surgeon and randomization of 83 out of 326 patients performed on by departmental staffs

SURGEON	N	Mean ± SD	Median	Minimum	Maximum
Staff	83	0.465±0.344	0.40	-0.10	1.51
Residents	83	0.819±0.639	0.70	-0.90	2.70
Total	166	0.642±0.542	0.50	-0.90	2.70

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Table 9. Surgical complication in each surgical group

Complications	Phaco	ECCE
Ruptured PC	7	3
Corneal injuries	8	1
Retained cortex	2	0
Iris trauma	1	3
Descemet strip	3	1
Endophthalmitis	1	0
Others	6	1
Total	28	9

capsule rupture, 9 eyes (2.2%) had some corneal injury, and 1 eye developed early postoperative endophthalmitis.

Discussion

The intent of the present study was to assess the impact of cataract surgery on the visual improvement and rate of complications. With innovative surgical techniques, the authors believe that patients who underwent cataract surgery would have good VA without glasses and have a minimal risk of surgical complications.

The authors found that 69.9% of patients had final uncorrected VA $\geq$ 6/12 (mean Log MAR VA 0.3007). Final VA was better in patients who underwent phacoemulsification (mean Log MAR VA 0.265) than in patients who underwent extracapsular cataract extraction (mean Log MAR VA 0.586).

Most previous articles(3-8) reported the visual improvement in reference to best-corrected VA, while the present study was interested in uncorrected VA. The reason is based upon the new concept of cataract surgery in which refractive error reduction, especially corneal astigmatism, brings the patients to emmetropia and a final VA gains to 6/6. The present study found that 25.4% of cases had a final VA 6/6 without glasses.

The present study showed that the final VA of patients who underwent phacoemulsification was better than those who underwent extracapsular cataract extraction. The reasons may be due to many factors such as less induced astigmatism or better baseline vision. When the authors compared the final VA with baseline VA of each patient, patients in the extracapsular cataract extraction group had a relatively greater improvement of postoperative VA (student-t-test P = 0.004). This was because the baseline VA of patients in extracapsular cataract extraction group was worse than in the phacoemulsification group.

Besides the effectiveness of surgery for the improvement of visual acuity, The present study found that there was a small risk of surgical complications. Kapoor, et al[9] reported a 5.6% rate of posterior lens capsule rupture and al Faran[10] also reported a 5.6% rate of posterior lens capsule rupture. The authors found only a 2.4% rate in the present study.

The authors found only one case of early postoperative endophthalmitis (rate 0.24%). The actual postoperative endophthalmitis rate in Siriraj Hospital has been reported between 0.2-0.3 percent per year.

Conclusion

In this study, cataract surgery improved postoperative VA $\geq$ 2 Snellen chart lines in both types of surgical techniques in 75.6% of cases. Eighty-seven percent of cases had a final VA $\geq$ 6/18 without glasses. Sixty nine point nine percent of cases had a final VA $\geq$ 6/12 without glasses, and 25.4% of cases had a final VA 6/6 without glasses.

The rate of complications in the perioperative and postoperative period in this study did not differ much from that found in previous reports.

Thus, it can be concluded that cataract surgery is safe and has the role of improving visual acuity. Most patients have a good final VA without glasses.

Acknowledgments

The authors wish to acknowledge Miss Sasima Thongsae, MSc (Statistics) for kindly assisting in the statistical analysis and ophthalmologists in the Department of Ophthalmology, Siriraj Hospital for allowing their patients to be studied.

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ผลการผ่าตัดรักษาโรคต้อกระจกในผู้สูงอายุในโรงพยาบาลศิริราช

ไธวดี ดุลยจินดา, วิรุต หนูขาว, สุชาดา กัมปนาทแสนยากร, ละอองศรี อัชชนียะสกุล, ธรรมนูญ สุรชาติกำธรกุล, กัญวรรณ ศรีหิรัญ

ได้ทำการศึกษาผลการผ่าตัดรักษาโรคต้อกระจกในผู้สูงอายุในโรงพยาบาลศิริราชโดยเลือกกลุ่มประชากรปรกติ เพื่อศึกษาผลของการผ่าตัดโดยเปรียบเทียบ visual acuity ก่อนและหลังผ่าตัดโดยเฉพาะอย่างยิ่ง visual acuity โดยไม่ต้องใช้แว่น (uncorrected visual acuity) รวมทั้งได้รายงานโรคแทรกซ้อนที่เกิดจากการผ่าตัด ผู้ป่วยที่ได้รับการผ่าตัดตั้งแต่ 1 มกราคม - 31 มีนาคม พ.ศ. 2547 มีผู้ป่วยที่เข้าเกณฑ์การวิจัยทั้งสิ้น 379 ราย (409 ตา) ผู้ป่วย 373 ตา (ร้อยละ 91.2) ได้รับการผ่าตัดด้วยวิธี phacoemulsification ผู้ป่วย 36 ตา (ร้อยละ 8.8) ได้รับการผ่าตัดด้วยวิธี extracapsular cataract extraction ในจำนวนทั้งหมดนี้ ผู้ป่วย 326 ตา (ร้อยละ 79.7) ได้รับการผ่าตัดโดยอาจารย์แพทย์ ผู้ป่วย 83 ตา (ร้อยละ 20.3) ได้รับการผ่าตัดโดยแพทย์ประจำบ้าน หลังผ่าตัด 4 เดือน จากจำนวนผู้ป่วยทั้งหมดพบว่าผู้ป่วยร้อยละ 25.4 มี final uncorrected visual acuity เท่ากับ 6/6 ผู้ป่วยร้อยละ 69.9 มี final uncorrected visual acuity $\geq$ 6/12 และผู้ป่วย ร้อยละ 87 มี final uncorrected visual acuity $\geq$ 6/18 ผู้ป่วยที่ได้รับการผ่าตัดด้วยวิธี phacoemulsification ร้อยละ 74.5 จะมี final uncorrected visual acuity ที่ดีขึ้น $\geq$ 2 แถว Snellen chart เมื่อเทียบกับก่อนผ่าตัด ส่วนผู้ป่วยที่ได้รับการผ่าตัดด้วยวิธี extracapsular cataract extractionร้อยละ 86.1จะมี final uncorrected visual acuity ที่ดีขึ้น $\geq$ 2 แถว Snellen chart เมื่อเทียบกับก่อนผ่าตัด สำหรับโรคแทรกซ้อนจากการผ่าตัดพบว่าโรคแทรกซ้อนที่พบบ่อยที่สุดคือการแตกของถุงหุ้มเลนส์ขณะทำผ่าตัด 10 ราย (ร้อยละ 2.4) และโรคแทรกซ้อนที่รุนแรงที่สุดคือภาวะติดเชื้อหลังผ่าตัด พบ 1 ราย (ร้อยละ 0.24)

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