COMPARISON OF POST-OPERATIVE REFRACTIVE OUTCOME AFTER PHACOEMULSIFICATION AND EXTRA CAPSULAR CATARACT EXTRACTION

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ABSTRACT

OBJECTIVE: The objectives of the study was to identify the refractive outcome after phacoemulsification and extra capsular cataract extraction and to compare refractive outcomes after both surgeries.

METHODOLOGY: A comparative cross-sectional study was conducted at department of the ophthalmology at Helper Eye Hospital Quetta for 3 months from October 2019 to December 2019. In the study, patients aged 40 to 60 years with both unilateral and bilateral senile cataracts and willing to participate were chosen. All patients were organized into two categories, Group A and Group B, respectively. Group A patients underwent a phacoemulsification surgical procedure (PHACO) and group B patients underwent extra capsular cataract Extraction. Surgeries were conducted by senior and expert surgeons with a minimum of 5 years of experience. The SPSS 23.0 version was used to analyze the results.

RESULTS: Total 174 were enrolled and two separate treatment strategies were used; their mean age was 53.97 + 8.41 Group A years and 55.58 + 5.27 Group B years. Most patients obtained 77.0% of group A visual acuity UCVA (> 6/9) over three weeks, compared to 18.4% of group B, p-value 0.001. In Group A, BCVA (> 6/9) was also measured significantly higher by 88.5% relative to Group B, p-value 0.001. The six-week visual acuity evaluation of UCVA and BCVA (> 6/9) was obtained in almost all Group A cases, relative to Group B, with a p-value of 0.001.

CONCLUSION: Patients those underwent PHACO had shown significant best final visual outcome on day one, three week and six weeks as compared to ECCE.

Key Words: Cataract, Refractive outcome, PHACO, ECCE

INTRODUCTION

Cataract is a chronic disease associated with aging process which is a main cause of reversible blindness worldwide, affecting around 20 million people, of which 95% are over 65 years of age, they have a noticeable opacity of lens.[1] World Health Organization (WHO) has reported the presence of 285 million visually impaired people worldwide, 80% of whom are preventable. It is assumed that of the 39 million blind in the world, 82% are over 50, and the main causes include cataracts 51%, glaucoma 8% and age-related macular degeneration 5%. Regarding the visual impairments, it appears that 65% are in the age group above 50 years old, and the main causes include uncorrected refractive errors 43%, cataracts 33% and glaucoma 2%.[2]

It is estimated that 90% of the blind live in developing countries, where cataracts appear early and last longer, causing problems in the social and economic progress, this being one of the causes and consequences of poverty.[3] The presence of cataracts can correlate increasing mortality rate, estimated between 1.25 and 1.5 times, and in this context, the rate of cataract surgery that so far the only curative treatment is surgery, which has proven to be highly

cost-effective. This consists of replacing the opaque lens with an intraocular lens by procedures including conventional extraction techniques and two modern techniques are used including phacoemulsification (PHACO) and extra capsular cataract extraction (ECCE). [4,5]

The most common cataract surgery technique due to it lower cost has been reported to be the extra capsular cataract extraction with implant of a polymethyl methacrylate lens (PMMA) in the posterior chamber through a sclera corneal incision of approximately 6 to 7 mm. The results obtained in visual acuity are comparable to those of the phacoemulsification, after several weeks and during this time the improvement is slow and the visual acuity (VA), and astigmatism is unstable.[6]

Over time, technological improvements have been made that make the surgery of cataract easy and safe.[7] This allows the extraction of the cataract lens through a 3 mm incision using a titanium tip that emits ultrasonic waves to mechanically fragment the lens and then aspirate it. Patients operated with this technique achieve a remarkable improvement in visual acuity a month after having been operated and the number of post-surgical astigmatism is less than that obtained in the extracapsular extraction.[8]

Phacoemulsification and Extra Capsular Cataract Extraction both are very important in regaining the vision, however no study has been done in Baluchistan. This study is of great importance to help in the identification of the outcome which is cost-effective and best management option for cataract surgeries. The objective of the study were to identify the refractive outcome after phacoemulsification and extra capsular cataract extraction and to compare refractive outcomes after PHACO and ECCE

METHODOLOGY

A comparative cross sectional study was conducted at department of the ophthalmology Helper Eye Hospital Quetta for 3 months from 1st October 2019 to 31st December 2019. Total sample size calculated for this study was 174, divided in two groups (n= 87 in each group). Simple random sampling technique was used. The ethical approval was taken from Research ethics committee of Liaquat University of Medical & Health Sciences Jamshoro and also the written permission was obtained from the head department of ophthalmology at Helper Eye Hospital Quetta. Inclusion criteria of the study was all the patients who were aged 40 to 60 years, with both unilateral and bilateral senile cataract, with uneventful cataract surgery. Patients with corneal opacity (were determined by Eye surgeon), complicated cataract and surgery (were defined by Eye surgeon) and patients with lens induced glaucoma were excluded from the study. A written consent obtained from all the subjects and the information collected through structured proforma. All the patients were divided into two groups 'group A' and 'group B'. Patients of group A underwent surgical procedure of phacoemulsification (PHACO) and patients of group B underwent extra capsular cataract extraction. All the surgeries carried out by senior and expert surgeons with minimum experience of 5 years.

All the data entered into SPSS 23.0 version and analyzed by using the same software. The quantitative data like age have been presented in form of mean ± S.D. Simple frequency and percentage computed. For categorical variables, Chi square test applied by taking P- value of ≤0.05 considered significant.

RESULTS

Total 174 were enrolled and underwent two different treatment methods, their mean age was 53.97 ± 8.41 years of group A and 55.58 ± 5.27 years of group B. Mean disease duration was 3.66 ± 2.44 years in group A and 3.49 ± 2.69 years in group B.

Table-I. Pre-operative mean of right eye visual acuity between PHACO and ECCE (n=174)

Variable	Surgical procedure		P-value
	Phacoemulsification	Extra capsular cataract	
Visual acuity right eye	38.12 ± 15.22	44.57 ± 17.35	0.069
Visual acuity left eye	39.66 ± 15.39	46.90 ± 18.16	0.197

Mean visual acuity of right eye was 38.12 $\pm$ 15.22 in group A and 44.57 $\pm$ 17.35 in group B, while mean visual acuity of left eye in group A was 39.66 $\pm$ 15.39 and in group B was 46.90 $\pm$ 18.16, findings were statistically insignificant.

Table-II. Day one visual acuity (UCVA and BCVA) comparison between PHACO and ECCE n=174

Visual acuity day one	Surgical procedures		P-value
	PHACO	ECCE	
UCVA			
>6/9	18(20.7%)	00	
6/12-6/18	62(71.2%)	65(74.7%)	0.001
6/24-6/60	7(8.0%)	22(25.13%)	
Total	87(100.0%)	87(100.0%)	
BCVA			
>6/9	26(29.9%)	00	
6/12-6/18	57(65.5%)	54(71.13)	0.001
6/24-6/60	4(4.6%)	33(28.7)	
Total	87(100.0%)	87(100.0%)	

On post-operative day one visual acuity >6/9 (UCVA) was achieved 18 (20.7%) cases of group A and no nay cases found in group B. 6/12-6/18 was achieved by 62(71.2%) patients of group A and 65 (74.7%) patients of group B. Worsen acuity 6/24-6/60 was seen in 22 (25.13%) patients of group B, which statically significant as compared to group A, p-value 0.001. Similarly day visual acuity BCVA (>6/9) achieved by 26(29.9%) patients of group A, which was statistically significant, p-value 0.001.

Table-III. Three weeks visual acuity (UCVA and BCVA) comparison between PHACO and ECCE n=174

Visual acuity Three weeks	Surgical procedures		p-value
	PHACO	ECCE	
UCVA			
>6/9	67(77.0%)	18(18.4%)	
6/12-6/18	20(23. %)	67(79.3%)	
6/24-6/60	00	2(2.3%)	0.001
Total	87(100.0%)	87(100.0%)	
BCVA			
>6/9	77(88.5%)	67(77.0%)	
6/12-6/18	10(11.5%)	19(21.9)	0.001
6/24-6/60	00	1(1.1)	
Total	87(100.0%)	87(100.0%)	

On three weeks assessment visual acuity UCVA (>6/9) was achieved by most of the patients 67(77.0%) of group A as compared to group B 18(18.4%), p-value 0.001. Visual acuity BCVA (>6/9) was also assessed significantly more in Group A 77(88.5%) as compared to group B, p-value 0.001. On six weeks assessment visual acuity UCVA and BCVA (>6/9) were achieved by almost all cases of group A as compared to group B, p-value 0.001.

Table-IV. Six weeks visual acuity (UCVA and BCVA) comparison between PHACO and ECCE n=174

Visual acuity Six weeks	Surgical procedures		p-value
	PHACO	ECCE	
UCVA			
>6/9	86(98.9%)	58(66.6%)	
6/12-6/18	1(1.1%)	29(33.4%)	
6/24-6/60	00	00	0.001
Total	87(100.0%)	87(100.0%)	
BCVA			
>6/9	77(88.5%)	74(85.0%)	
6/12-6/18	10(11.5%)	12(15.0)	0.001
6/24-6/60	00	1(00)	
Total	87(100.0%)	87(100.0%)	

DISCUSSION

The study showed mean age of the participant was 53.97±8.41 years of group A and 55.58 ± 5.27 years of group B. In this study most of the cases were illiterate and having low socioeconomic status. These findings were similar to the others studies as; associations have been documented between higher prevalence of blindness (regardless of cause) and being female, living in a rural area, having low socioeconomic status, being less educated and belonging to an ethnic minority.[51] Cabrera *et al*[9] recently conducted a study in Mexico to determine socio-economic factors associated with cataract patients; more than half the patients had not been educated beyond the primary level, while half the patients enrolled in primary ophthalmological care an year after the onset of symptoms.

According to the gender distribution males were found in majority in both groups as 54.0% in group A and 51.7% in group B, while 46.0% were females in group A and 48.3% in group B, with insignificant difference p-value 0.761. Most of the cases were illiterate in both groups as 66.7% in group A and 72.4% in group B. On other hand Thevi T et al[10] reported that most patients (38%) were in 61–70 years of age group. In this study males were found in majority in both groups as 47(54.0%) in Phacoemulsification group A and 45(51.7%) in group B, while 40(46.0%) were females in group A and 42(48.3%) in extra capsular cataract extraction (ECCE) group B. while a study conducted by Naik et al[11], In group I, the mean age was 59.2±9.8 years (range=44-87years), while in group II it was 59.5±11.1 years (range=41-80 years). In both categories, the age distribution was comparable. There were 34 males and 21 females in Category I. There were 28 males and 27 females in Group II. In another study of Oderinlo O et al[12] stated that 50.4% were females and 49.6% were males, with a mean age of 65.3 ± 11.10 years. Kara-Junior N et al[13] also found comparable findings regarding age and gender as mean age of patients in both groups were 69 ± 9 years (ECCE-group) and 68 ± 9 years (PHACO-group), (p = 0.70), where (in PHACO-group) 35.3% and (in ECCE-group) 44.1% of the patients were males.

In this study on six weeks assessment visual acuity UCVA and BCVA (>6/9) were achieved by almost all cases of Phacoemulsification treated group as compared to those underwent extra capsular cataract extraction (ECCE), p-value 0.001. And on six weeks assessment visual acuity UCVA and BCVA (>6/9) were achieved by almost all cases of group A as compared to group B, p-value 0.001. Similarly in the study of Thevi T et al[10] reported that in the setting of a District Hospital, PHACO showed to have a superior final visual outcomes than ECCE. It was similar to NED findings (2002-2011), in which 91.5 percent of cases undergoing PHACO had a better vision (6/12) than those 83 % cases undergoing Extra Capsular Cataract Extrection.[14] This supports the findings of Nepalese study, in which 91.7% of cases in PHACO-group showed better visual outcomes than ECCE-group.[15] Study performed by Baig et al[16] reported contrary results, in the MSICS community, the induced astigmatism was lower relative to the ECCE group at the first day, but no substantial difference was observed after six weeks. After three weeks, corneas

were clear in both groups. At 6 months of follow-up, 22 (12.5 percent) group 1 patients and 27 (14.6 percent) group 11 patients had Elschnigs Pearls.

In randomized trials from two Eye Hospitals (Oxford and Moor fields), the ratios of patients attaining vision correction of 6/9 or more were significantly greater in the PHACO-group (69%) than those in ECCE-group (57%).[17] Khan et al,[18] also reported better visual outcomes in PHACO-group (80%) than ECCE-group (54%). Similar findings were also reported by Arriaga ME and Lozano J[19] (76% cases in PHACO-group and 66% cases in ECCE-group). An observational, multicenter study of Loo et al,[20] conducted in three ophthalmology departments in Malaysian hospitals (Health Ministry) reported that 3 months before surgical procedure, corrected vision acuity outcome was better in PHACO-group (94%) than ECCE-group (81%). While inconsistently Quinlan M. et al[21] reported no significant difference between phacoemulsification and ECCE procedure on the nature and rate of in-vitro cell growth on posterior capsule. Dowler JG et al[22] concluded that PHACO is superior than ECCE in terms of postoperative vision acuity with less postoperative inflammatory response, and with reduced risk of capsulotomy surgical procedure. Toyama T et al[23] reported that PHACO is safe and effective in enhancing vision acuity equally among both the younger patients and the patients with age range ≥90 years, at least if accomplished by skilled surgeons. Ahmed AM et al[24] reported that Phacotrabeculectomy provides early recovery of vision more sustained and effective IOP control than extra capsular cataract extraction trabeculectomy. PHACO has become a common procedure in cataract extraction within the developed countries, where rehabilitation of the patient is very fast, associated with good visual outcomes. PHACO enables the quicker and more likely wound healing, less uncomfortable for the patient, fewer wound-associated complications, and lesser changes of postoperative astigmatism than conventional ECCE.[48] PHACO also enables to achieve superior quantitative and qualitative IOP control in terms of duration and range of IOP control than extra capsular cataract extraction trabeculectomy yet following 12 months of surgical procedure.[47] Kalpadakis P et al[25] observed that endophthalmitis develops significantly later among extra capsular cataract extraction cases than phaco cases. Therefore hygiene conditions among extra capsular cataract extraction operated patients have a greater impact. PHACO is proposed to be better than extra capsular cataract extraction in reducing the risk of endophthalmitis following cataract extraction among subjected living in under standard conditions. Kara-Junior N et al[13] also reported that PHACO is effective an cost-effective intervention because of its impact on Brazilian public healthcare system, since it improve the quality of life. The international community normally does not promote the usage of PHACO procedure with foldable IOL implant in underdeveloped nations ' public healthcare structures, given the general agreement throughout the literature regarding its clinical advantages and diminished individual costs.[50]

CONCLUSION

In the District Hospital setting, PHACO has been shown to have a better final visual outcome compared with ECCE. Yet ECCE also delivers good results. The ECCE preparation does not take long and can be performed by virtually all ophthalmologists. It can be achieved with the required instruments in a working operation theatre, which do not cost much. Because of better outcomes with PHACO, however, we suggest that district hospitals be supplied with the PHACO system, instruments and appropriate facilities for intraocular surgery, and that doctors and paramedics be qualified so that improved eye care services can be offered to the general public.

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