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Original article

A COMPARATIVE STUDY OF PRE- AND POST-OPERATIVE REFRACTIVE ERRORS IN CATARACT SURGERY – PHACO & SICS.

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Abstract.

Background:

The method of phacoemulsification for cataract surgery is preferred by surgeons, but it is not an affordable method. On the other hand, small-incision cataract surgery performed manually is economically affordable. This is a comparative study conducted prospectively to analyze the visual ability of the patients who had cataract extraction surgery by either of the methods.

Method:

50 patients had cataract extraction by phacoemulsification and another 50 patients who underwent manual incision cataract surgery were included in the prospective comparative study. The refractive errors and the visual acuity of the subjects were evaluated in the follow-ups conducted after a day, three days, a week, three weeks, for weeks, six weeks, and 12 weeks after the surgery. The results obtained were statistically compared.

Result:

The observations of the refractive errors after the surgery were comparable in both methods. The difference in the refractive errors was significant with phacoemulsification and manual small-incision cataract surgery. However, the visual acuity was better than the preoperative baseline visual acuity.

Conclusion:

Phacoemulsification is a superior method for cataract surgery when compared to the manual incision method in terms of the occurrence of refractive errors after the surgery.

Recommendation:

The history of any ocular surgery or contact lens use must be documented. Accurate preoperative measurements should be verified and repeated if they do not make sense.

Keywords: phacoemulsification, smallincision cataract surgery, refractive errors, visual acuity,
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1. INTRODUCTION.

Age-related opacification of the corneal lens is the major cause of suboptimal vision in the geriatric population [1]. If it is not extracted, it can cause complete blindness and increase incidences of falls and injury [2]. There are various procedures for cataract extraction, however, the majority of surgeons perform either phacoemulsification or small incision cataract surgery is done manually.

Both procedures have their own sets of benefits and disadvantages. The occurrence of refractive

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errors such as impaired vision that is not able to distinguish between objects and long-sightedness due to the surgery can affect the quality of life of the patients [3]. The refractive errors are the result of improper placement of the lens and the size of the incision. Studies have been conducted to compare the efficiency of both methods. The findings of these studies vary depending on the region and experience of the professional performing the surgery [4, 5].

Phacoemulsification requires ultrasound and the density of the nucleus determines the time required to place the lens [5]. Both these factors are influenced by the training of the surgeons and the sophisticated facilities available. The other method is economical and does not require highly trained precision but since manual incision is placed in the small incision cataract surgery the location and depth of the incision can increase the chances of refractive errors [6].

Since cataract extraction is the only treatment option to prevent complete blindness in the geriatric population, a procedure that imparts maximum benefits and minimum errors is the responsibility of optical surgeons [7]. This study aims to draw a comparison of the patients undergoing cataract extraction by either phacoemulsification or small incision cataract extraction methods. The outcome of the surgery is that the occurrence of refractive errors and the improvement of the visual acuity in comparison to the preoperative baseline visual acuity are observed here during the follow-ups after the surgery.

2. METHODS.

2.1. Study Design and Population.

The patients visiting the ophthalmology department of a tertiary care hospital were considered for this study. This study was conducted based on prospective observations made after performing cataract extraction surgery. Sample size calculation was based on previous studies which reported 36% improvement in the vision after the phacoemulsification method and 18% improvement in the vision after the small incision cataract surgery [4, 6].

2.2. Inclusion and Exclusion Criteria.

The patients who had lens power in between 16-24 diopter and were at 6/18 visual acuity on Senelle's chart with opacification of the lens were considered for the study. The patients who were above 40 years and below the age of 70 years were only included in the study. The patients who had undergone any other ocular surgery, had glaucoma, allergies, infection in the eye, opacification of the lens but not due to age, complicated cataract, other eye disorders, and systemic diseases that could influence the outcome of the surgery were not considered for the surgery.

2.3. Data Collection and Analysis.

A total of 100 patients were selected and divided into two groups: group A was the patients who had phacoemulsification extraction and group B was the patients who had manual small incision cataract extraction surgery. The subjects selected for the study were thoroughly examined. Ocular examination was conducted to determine the baseline visual acuity of the patients which included A scan, B scan, slit lamp test, keratometry, macula test, Schirmer's test, lacrimal sac patency, and ophthalmoscopy. Throughout the patients were monitored for symptoms like redness, pain, irritation, and lacrimation which could indicate the development of ocular problems.

Systemically the patient's blood was evaluated for sugar levels, hemoglobin count, presence of electrolytes, and infection. Later on, the data obtained preoperatively and post-operatively was analyzed using a statistical program for social science and the data was compared using Pearson's value. The comparison was considered to be statistically significant if the p-value was less than 0.05.

3. RESULTS.

A total of 100 patients were included in this study. At the initial stage, 173 patients were examined for eligibility, however, 73 patients were excluded from this study due to not being eligible. The average age of the patients in group A

was 61.72 and the average age of patients in group B was 62.91. The difference between both groups was not statistically significant. The number of females was more in both groups compared to the males but the difference in the female-to-male ratio was not significant.

The difference in the visual acuity was not statistically significant amongst both groups, as illustrated by Table No. 1. When the visual acuity and best corrected visual acuity were compared before the surgery for both groups the difference was not statistically different. When the visual acuity and the best corrected visual acuity were compared until the 3rd week post-surgery the difference between both the groups was statistically significant as the p-value for them was more than 0.05. When the visual acuity and best corrected visual acuity were compared after the 3rd week post-surgery the difference between them was not significant statistically. This implies that the visual acuity improved in the small incision cataract extraction surgery group after the 3rd week of the surgery. However, the phacoemulsification group had significant improvement in the visual acuity right from day 1 postoperatively.

When the occurrence of refractive errors such as changes in the sphere curvature of the lens and astigmatism due to surgery was compared the average of such errors was higher in group B than in group A at all the intervals even after 12 weeks of surgery. The difference in the occurrence of these errors when compared statistically the p-value was less than 0.05 at all the intervals. This indicated that the errors were more in group A than in group B.

4. DISCUSSION.

It is observed in the study that visual acuity unaided and the best corrected improved in the phacoemulsification group than in the small incision cataract surgery group. The difference in them was statistically significant until the 3rd week post-surgery. However, after the 3rd week and during the 4th week follow up it was observed that both groups had comparable visual acuity.

The findings of our study are contradictory to many other studies conducted [8, 9]. In one such study, it was observed that the visual acuity improved by 61.8% in the phacoemulsification group and for the group with small incision cataract surgery the improvement was 63.5% and the difference between both the groups was not statistically significant [10]. This could be explained by the time interval of follow-up as in this study it is observed that the difference was statistically significant after the 3rd week which indicates visual acuity improved after the 3rd week postoperatively in the case of patients with small incision cataract surgery.

When the comparison is made for the occurrence of an error, it is observed that the average change in the spherical error was significantly more in the case of the small incision cataract surgery group compared to the phacoemulsification group. Although preoperatively the difference in both the groups was not statistically significant. The difference remained constant even after 12 weeks and the error did not improve after 3 weeks' post-surgery as it was with visual acuity. Similar results are found with astigmatism. The difference between both groups was not significant statistically before the surgery. However, post-surgery the difference amongst the groups was significant right from day 1 and it did not improve after 3 weeks of the surgery. These findings are from other studies conducted [11, 12].

One of the studies stated that steeper and smaller incisions in the manual incision method can significantly reduce the occurrence of errors [13]. The observation from this study is that both methods are equally efficient in improving visual acuity, but the occurrence of errors is much less in the phacoemulsification method than in the small-incision cataract surgery method.

5. CONCLUSION.

It can be concluded from the study that both methods are comparably efficient in the extraction of the cataract and improving the visual acuity. However, phacoemulsification is superior in terms of fewer errors as compared to the small-incision cataract extraction surgery method. Phacoemul-

Table 1: **Comparison of the P value at all the intervals.**

Parameters	Period							
	Pre-operative	Day 1 after surgery	Day 3 after surgery	Day 7 after surgery	Week 3 after surgery	Week 4 after surgery	Week 6 after surgery	Week 12 after surgery
Unaided visual acuity	0.391	0.0001	0.002	0.037	0.019	0.054	0.102	0.096
Best aided visual acuity	0.33	0.0001	0.0001	0.01	0.003	0.098	0.047	0.514
Spherical error	0.51293	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Astigmatism	0.331	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Age	0.085	-	-	-	-	-	-	-
Side of the eye	0.67	-	-	-	-	-	-	-
Female is to Male ratio	0.203	-	-	-	-	-	-	-

sification requires sophisticated instruments and a high level of expertise.

6. LIMITATION.

The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population.

7. RECOMMENDATION.

The history of any ocular surgery or contact lens use must be documented. Accurate preoperative measurements should be verified and repeated if they do not make sense.

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10. CONFLICT OF INTEREST.

The authors report no conflicts of interest in this work.

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