

# Phacoemulsification: The first 50 Cases

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## Abstract

**Background:** To study and document the visual results, astigmatic changes and complications in first 50 cases of phacoemulsification.

**Methods:** A study of first 50 cases of phacoemulsification performed by a single surgeon, was conducted in Eye Unit 1 of Services Hospital Lahore from January to June 1997. After proper case selection and thorough evaluation, phaco surgery was performed by either corneal or scleral tunnel technique. The incision size was kept at 5.5mm or 6.5mm depending upon the diameter of lens optic. The decision of suturing was made on the table. Postoperative examinations were conducted on day 1, week 1, week 3 and week 6 which included assessment of UCVA(uncorrected visual acuity), BCVA (best corrected visual acuity), complications and astigmatic changes.

**Results:** Preoperative visual acuity ranged between hand movements and 6/18. On the first postoperative day, 24% of eyes attained a UCVA of 6/12 or better, while 48% of cases had a BCVA of 6/12 or better. One week after surgery, UCVA of 6/12 or better was present in 52% and BCVA of same magnitude in 68% of cases. At the end of sixth postoperative week, UCVA of 6/12 or better was seen in 84% and BCVA of same amount in 96% of eyes. The complications seen during the procedure were PC(posterior capsular) rent in one eye, PC rent with vitreous loss in 2 eyes and iris damage in 3 eyes. On the first postoperative day, striate keratopathy was seen in 58% of eyes. After 6 weeks, CME(cystoid macular edema) was seen in 5 eyes. The scleral tunnel 6.5mm sutured group was compared with the unsutured group for astigmatism. After 6 weeks, 62.5% of eyes in sutured group and 0% of eyes in unsutured group had > 2.0D(diopter) astigmatism (statistically significant). In sutured group, only 62.5% of eyes reverted to their preoperative meridian of astigmatism when examined after 6 weeks as compared to 90% of eyes in unsutured group.

**Conclusion:** Phacoemulsification leads to an early visual rehabilitation with minimal complications and astigmatic changes, even in beginners if the procedure is followed meticulously.

## Introduction

Traditional cataract surgery faced a dramatic change in the past decade. Phacoemulsification started replacing ECCE ( extracapsular cataract extraction) because of early visual rehabilitation and has now become the procedure of choice.

After a routine ECCE, 8 to 10 weeks are required for the improvement in visual acuity. Meanwhile, post-surgical astigmatism keeps on changing in magnitude and orientation. This induced astigmatism depends upon the size of incision, location of incision and the technique of wound closure.

The local anaesthesia has shifted from retrobulbar to peribulbar or topical. The efficacy of peribulbar anaesthesia can be enhanced by adding hyaluronidase, which causes better tissue penetration<sup>1</sup>. In phacoemulsification, the incision length is reduced to 3.2 or 5.5mm and in some cases, even 0.9mm. In cases of scleral tunnel incision, the wound starts 2mm behind the limbus. The wound is within clear cornea in case of corneal valve incision. Sutures are not applied in cases of smaller incision. All these factors reduce the post-operative astigmatism, lead to an early stabilization of refraction and hence early visual rehabilitation<sup>2</sup>.

Assessment of the right depth of initial groove (before cracking) can be enhanced by adding 0.25% fluorescein to methylcellulose during hydrodissection<sup>3</sup>. PC may be damaged during the last stages of phaco or cortex removal. Leaving behind some residual cortical lens matter may be preferable to a rupture in the posterior capsule<sup>4</sup>. The purpose of the study was to document the visual improvement, astigmatic changes and complications in first 50 cases of phacoemulsification.

## Patients and Methods

A study of 50 cases of phacoemulsification by one surgeon was conducted in Eye Unit-1 of Services Hospital Lahore, from January to June 1997. The

patients included in the study were those with red fundal reflex sufficient enough to allow good visualization of the anterior capsule. The patients having following characteristics were excluded from the study; Pre-operative corneal opacification, pseudoexfoliation, irido/phacodonesis, poorly dilating pupils, glaucoma, retinal or optic nerve pathology, dense cataracts, deep-set eyes and very old patients.

All surgeries were performed under peribulbar local anaesthesia. In cases of large optic diameter lenses, a 6.5mm incision was made while in small optic diameter lenses, the incision was 5.5mm. Sutures were applied in early cases as a precaution, which were reduced in number in subsequent cases and finally omitted. In 28 cases, sutures were applied while in 22 cases, the wound was left unsutured.

Post-operative examinations were conducted 1 day, 1 week, 3 weeks and 6 weeks after surgery. For the purpose of study of astigmatism, six groups were formed retrospectively. These were the following:

- Group 1- Sutured scleral tunnel 6.5mm (16 eyes)
- Group 2- Un-sutured scleral tunnel 6.5mm (20 eyes)
- Group 3- Sutured scleral tunnel 5.5mm (4 eyes)
- Group 4- Un-sutured scleral tunnel 5.5mm (2 eyes)
- Group 5- Sutured corneal tunnel 6.5mm (6 eyes)
- Group 6- Sutured corneal tunnel 5.5mm. (2 eyes)

For the purpose of comparative study, these eyes were further divided into those with  $\leq 2.0$  D of astigmatism and those with  $> 2.0$  D of astigmatism. Similarly according to the meridian of astigmatism, these eyes were divided into those having ATR (against-the-rule), WTR (with-the-rule) and oblique astigmatism.

ATR astigmatism was assigned when the stronger meridian was located between  $0^\circ$  and  $29^\circ$  or  $150^\circ$  and  $179^\circ$ . The astigmatism was labeled WTR when the stronger meridian was oriented between  $60^\circ$  and  $119^\circ$ . The astigmatism between  $30^\circ$  and  $59^\circ$  or  $120^\circ$  and  $149^\circ$  was designated oblique astigmatism.

## Results

There were 24 males and 26 females in the study. The patients had a mean age of 57 years (standard deviation +/- 10.47). There were 14 diabetics in the study. Pre-operative BCVA ranged between hand movement and 6/18. (Table 1).

One week after surgery, BCVA of 6/12 or better was seen in 68% of cases (Table 3). At the end of the third post-operative week, 88% had BCVA of 6/12 or better (Table 4). After the sixth post-operative week, 96% of cases had BCVA of same magnitude (Table 5).

**Table 1 Preoperative visual acuity**

Visual acuity	Percentage
Hand movement	12
Counting fingers	32
6/60	16
6/36	16
6/24	16
6/18	8

**Table 2. Postoperative visual acuity (1<sup>st</sup> day)**

Visual acuity	Percentage	
	UCVA	BCVA
6/6	none	8
6/9	8	24
6/12	16	16
6/18	24	24
6/24	16	12
6/36	8	4
6/60	16	none
Counting fingers	12	12

On the first post-operative day, BCVA of 6/12 or better was seen in 48% of cases (Table 2).

**Table 3 Postoperative visual acuity (1<sup>st</sup> week)**

Visual acuity	Percentage	
	UCVA	BCVA
6/6	none	20
6/9	12	36
6/12	40	12
6/18	12	8
6/24	8	12
6/36	4	8
6/60	20	none
Counting fingers	4	4

Intraoperative complications occurred in 5 patients (10%). In 2 eyes (4%), there was PC rent with vitreous prolapse. One of these cases also had iris trauma. In 2 cases (4%), there was iris trauma alone, while one eye (2%) had PC rent without vitreous loss.

Both the cases with vitreous loss achieved a final BCVA of 6/6. The other 2 eyes with iris chewing achieved 6/9 visual acuity. One of these had early age-related macular degeneration and the other cystoid macular edema. The last-mentioned case was also diabetic. In this eye, the pupil became mid-dilated and atonic after surgery. The patient with PC rent developed CME and had a final BCVA of 6/36. The major factor limiting visual improvement on the first postoperative day was striate keratopathy. It occurred in 29 patients (58%) and subsided in all the patients after one week.

**Table . 4 Postoperative visual acuity (third week)**

Visual acuity	Percentage	
	UCVA	BCVA
6/6	12	40
6/9	28	28
6/12	16	20
6/18	20	4
6/24	4	none
6/36	12	4
6/60	4	none
Counting fingers	4	4

**Table 5 Postoperative visual acuity (sixth week)**

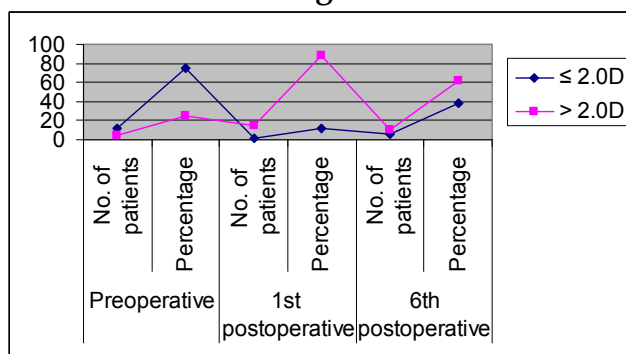
Visual acuity	Percentage	
	UCVA	BCVA
6/6	36	64
6/9	32	24
6/12	16	8
6/18	8	4
6/24	4	none
6/36	4	none

The mean pre-operative IOP (intraocular pressure) was 13.0mmHg, while 6 weeks after surgery it was 11.6mmHg. At all post-operative examinations the mean IOP remained between 11.50 and 13.50mmHg .

A comparison of astigmatic changes was carried out between the two larger groups i.e. group 1 (sutured scleral tunnel) and group 2 (unsutured scleral

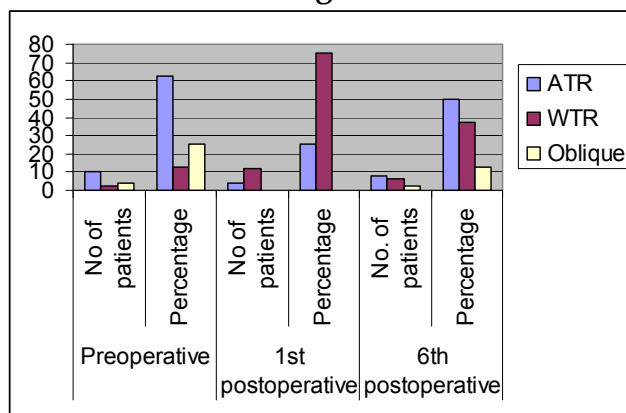
tunnel). In group 1, there were 16 eyes. 75% of the eyes had a pre-operative astigmatism of  $\leq 2.0D$  and 25% of the eyes had  $> 2.0D$  astigmatism. One week after surgery, majority of the eyes showed more than 2.0D astigmatism (87.50%). When examined 6 weeks after surgery, this percentage was reduced again and 62.50% of the eyes were seen in this category of high astigmatism (Fig 1).

**Fig 1.**



Comparison of  $\leq 2.0D$  vs.  $> 2.0D$  astigmatism between preoperative and postoperative eyes in group 1

**Fig 2.**



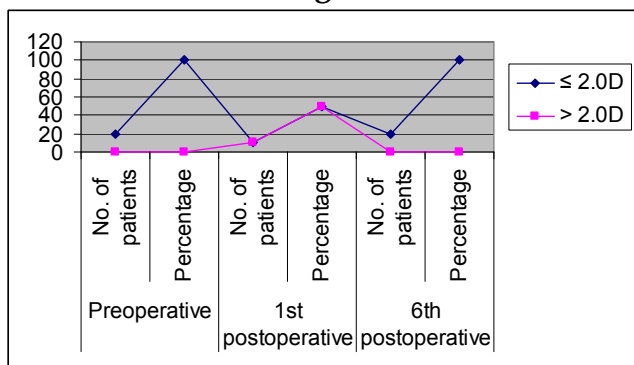
Comparison of orientation of meridian of astigmatism between preoperative and postoperative eyes in group 1

Regarding the meridian of astigmatism in group 1, 62.50% of the eyes had ATR astigmatism, 25% had oblique astigmatism and only 12.50% WTR astigmatism. One week after surgery, majority of the eyes had WTR astigmatism (87.50%). Six weeks after surgery, 50% of the eyes had ATR astigmatism, 37.50% WTR and only 12.50% oblique astigmatism (Fig 2).

In group 2, there were 20 eyes. Pre-operatively all had  $\leq 2.0D$  astigmatism. After the first post-operative week, half of them had  $> 2.0D$  astigmatism. Six weeks after surgery, all of the eyes showed  $\leq 2.0D$

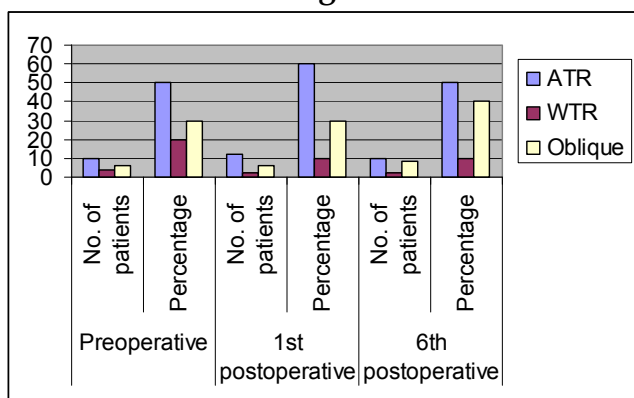
astigmatism (Fig 3).

Fig 3.



Comparison of  $\leq 2.0$  D vs.  $> 2.0$  D astigmatism between preoperative and postoperative eyes in group 2.

Fig 4



Comparison of orientation of meridian of astigmatism between preoperative and postoperative eyes in group 2

Similarly, ATR astigmatism was seen pre-operatively in 50% of eyes, oblique in 30% and WTR in 20% of eyes. One week after surgery, 60% of the eyes had ATR, 30% oblique and 10% WTR astigmatism. After the sixth post-operative week, 50% had ATR, 40% oblique and only 10% WTR astigmatism (Fig 4).

The scleral tunnel 6.5mm sutured group was compared with the unsutured group for astigmatism. Paired student's t-test was applied to study the pre-operative and sixth post-operative week astigmatism. In group 1 (sutured group), the post-operative astigmatism increased and the difference in astigmatism was found to be statistically significant at 5%  $\alpha$  value. In group 2 (unsutured group), the difference was not statistically significant. After the sixth post-operative week, majority of the eyes in group 1 (62.50%) had  $> 2.0$ D astigmatism, while in group 2, all the eyes showed  $\leq 2.0$ D astigmatism.

Individual cases were evaluated in order to

determine the percentage of eyes that regained their original orientation of meridian of astigmatism. In group 1 (sutured group), only 62.50% of eyes reverted to their original direction of astigmatism when examined six weeks after surgery. In group 2 (unsutured group), 90% of the eyes regained their original orientation of astigmatism after six weeks.

## Discussion

Phacoemulsification is becoming the procedure of choice for cataract extraction by majority of eye surgeons.

In our study, the areas of focus were visual improvement, complications and post-operative astigmatic changes. One week postoperatively, 52% of eyes achieved a UCVA of 6/12 or better. Potamitis et al <sup>5</sup>, conducted a study of phacoemulsification versus endocapsular cataract extraction. A UCVA of 6/12 or better was achieved in 50% of phacoemulsified eyes one week after surgery 81.81% of eyes undergoing phacoemulsification showed a final BCVA of 6/12 or better. In contrast, our results depicted a BCVA of 6/12 or better in 96% of eyes at the sixth postoperative week.

In the study of Tarbet et al <sup>6</sup>, concerning phacoemulsification performed by residents, 90.60% of cases showed improvement in BCVA to 6/12 or better.

Khan et al <sup>7</sup> reviewed 100 cases of phacoemulsification. The preoperative visual acuity was perception of light to counting fingers in 59% and 6/24 or better in 41% of cases. Our study consisted of 44% of eyes with preoperative vision of hand movement to counting fingers and 24% with 6/24 or better vision. In their study, 58% of cases with IOL (intraocular lens) had postoperative visual acuity between 6/6 and 6/12, while 18% had a visual acuity of 6/18. 24% of patients had less than 6/18 vision. Our study showed 94% of eyes with IOL having corrected vision after 6 weeks between 6/6 and 6/12 while only 4% had 6/18 visual acuity. There was no patient with BCVA of less than 6/18, 6 weeks postoperatively.

A statistically significant increase in postoperative astigmatism was found in group 1. No significant difference in astigmatism was seen in group 2 between the preoperative and sixth postoperative week values (paired Student's t test at 5%  $\alpha$  value). 90% of eyes in group 2 (unsutured) regained their preoperative meridian of astigmatism as compared to only 62.5% of eyes in group 1 (sutured) at the end of sixth postoperative week.

Minor fluctuations in the mean IOP were

observed at all postoperative examinations in our study. There was a tendency towards lowering of IOP after surgery. From a preoperative mean value of 13.0mmHg, it was 11.60mmHg after the first postoperative week. The same mean value of IOP was observed after the sixth week. Storr-Paulsen and Henning<sup>8</sup> described a preoperative IOP of 15.4mmHg in their patients. After one week, IOP was 14.8mmHg which further reduced to 13.8mmHg at one year after surgery.

Tarbet et al<sup>6</sup> defined major intraoperative complications as any in which there was vitreous loss, whether associated with posterior capsular rupture or zonular dehiscence. They defined minor complications as those which included posterior capsular rent or zonular dehiscence (without vitreous loss) and iris trauma. In their study of 300 cases of phacoemulsification performed by residents, complications occurred in 6.3% of cases. There was vitreous loss in 3.3% of cases. Posterior capsular rupture (without vitreous loss) was seen in 2.3% and zonular dehiscence and iris trauma in 0.3% of cases each.

The incidence of CME in our study was 10% (5 cases) as compared to 3.33% (10 cases) in the study described by Tarbet et al<sup>6</sup>. In the study of Khan et al<sup>7</sup>, corneal edema was seen in 15% of cases. The edema subsided in all the cases after one week. There was PC rent in 7% and iris trauma in 2%. One case had postoperative ptosis and ophthalmoplegia. Nucleus was lost into the vitreous cavity in one eye. Mathai and Thomas<sup>9</sup> have cited 0.8% incidence of nuclear drop in their study. In our study, there was no incidence of postoperative ptosis, ophthalmoplegia or lost nucleus.

## Conclusion

Phacoemulsification leads to an early visual rehabilitation with minimal complications and astigmatic changes, even in a beginner, if there is proper case selection, methodical surgical steps and willingness to modify the procedure in cases of difficulty.

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