

CORNEAL PROBLEMS DURING AND AFTER PHACOEMULSIFICATION BY BEGINNER PHACOEMULSIFICATION SURGEON

Abrar Ali¹, Tabassum Ahmed², Tahir Ahmed³

ABSTRACT

Objective: To determine the corneal problems faced during and after phacoemulsification (phaco) as a beginner of phaco surgeries

Methodology: Corneal problems in 100 cases of phaco were retrospectively analysed. Those cases with nuclei +3 / above and those who were operated in camps were excluded. Phaco-chop technique was used in 80% of cases. Average duration of surgery was 20 minutes

Results: Corneal problems were analysed during and after phaco procedures. During phaco corneal abrasion was developed in 40% of cases, detachment of Descemet's membrane was developed in 03% of cases. After phaco on first few days the main corneal problem was corneal edema and striate keratopathy which was in 53% of cases.

Conclusion: To reduce corneal problems one has to reduce phaco time and power. We have done phaco in the anterior chamber in most of cases which have increases the chances of corneal endothelial damage and resulted in more corneal edema and striate in early postoperative period so one should try to do phaco in bag. Sharp instruments should be used. Phaco should be done in selected cases rather does "do phaco in all cases" strategy.

KEY WORDS: Phacoemulsification (phaco), Corneal abrasion, Corneal endothelium.

Pak J Med Sci May - June 2007 Vol. 23 No. 3 401-404

INTRODUCTION

The commonest cause of preventable blindness and low vision is cataract.^{1,2} Till now no effective non-surgical treatment for cataract is available. Surgeries for the treatment of cataract are the commonest surgical procedures in ophthalmology.³ Phacoemulsification with inserstion of intraocular lens has become the procedure of choice for dealing with cataract.⁴ First phaco was carried out by Charles Kelman

in 1967.⁵ Phaco permit removal of cataractous lens through a smaller incision and quicker visual recovery and physical rehabilitation. Well known complications of phaco procedure include corneal abrasion, hydration of cornea, posterior capsular rupture, iris damage, corneal edema, endophthalmitis and rupture of the posterior capsule.⁶⁻¹¹ Corneal edema and striate produces problem in first few days to surgeons and patients. In this study overall corneal problem during and after phaco surgery were analysed.

PATIENTS AND METHODS

In this retrospective study, we analysed corneal problems encountered in those first 100 cases of phaco surgeries in which there was cortical / subcapsular and cataract with 0 to +2 dense nuclei during 2001 to 2002 period. Cases were selected from out patient department of Nisar eye Hospital and Hamdard

1. Dr. Abrar Ali,
 2. Dr. Tabassum Ahmed,
 3. Dr. Tahir Ahmed,
- 1-3: Hamdard College of Medicine and Dentistry

Correspondence

Dr. Abrar Ali
1-D-1/2, Nazimabad, Karachi
E- Mail: abrar_ali@hotmail.com

- * Received for Publication: November 16, 2006
- * Revision Received: January 8, 2007
- * Revision Accepted: January 28, 2007

University Hospital Karachi. Operations were done in these two hospitals on company and private patients. Complete thorough anterior segment and fudus examination was done. Cornea was examined by slit lamp to rule out corneal dystrophies and other corneal pathologies. Those patients with corneal dystrophies, nuclei of +3 or above were excluded from study. Phaco done in free eye camps were excluded. Laboratory investigations including complete blood picture, ESR, Urine detail report were done. In all patients I / V cannula was passed before operation as precautionary measure to manage patient in emergency during operation. After all aseptic precaution operation was started. Facial nerve was blocked in all cases using O'Brain method. Peribulbar anaesthetic technique in 24 of cases and retrobulbar technique was used in 76% of cases. No operation was done under topical anaesthesia. Superior rectus suture was given in few cases. Pupils were dilated with tropicamide 1% and phenylephrine 10% eye drops.

Three step tunnel incision was given at about 11° clock position with 3.2mm keratome. Anterior chamber was filled with methylcellulose 2%. For capsulorhexis bent 27G needle was used as cystotome in all cases. Side port was made with 15 degree knife and in few cases with NO.11 knife. Peritomy was done at incision site. Hydrodissection was done in 99% of cases and in few cases especially with posterior subcapsular cataract hydrodelineation was also done. We always operated by two hands technique. Phaco machine (Alcon Universal I, Alcon Universal II and Italian Admiral II) were used which were set at two memories (Table-I). Phaco tip during procedure was kept in anterior chamber at the plane of iris. The remaining lens matter was removed and aspirated by Simco I/A cannula. Anterior chamber and lens capsular bag was filled with methylcellulose 2%. The incision was enlarged by 5.2 or 5.5mm keratome. In few cases the enlargement was done by NO 11 knife. In 85% cases phaco PMMA intraocular lens were implanted in the bag. One or two 10/0 nylon

Table-I: Phaco setting

	<i>Memory 01</i>	<i>Memory 02</i>
Ultrasound power (Percentage)	70	50
Vaccum (mmHg)	30	100
Flow (cc/min)	25	25

suture was given at phaco port in 75% of cases. Subconjunctival antibiotic (gentamycin 40mg) and steroid (dexamethasone 2mg) injections were given. Total duration of surgery was from 15 minutes to 30 minutes. Patients were followed in OPD on next day, after one week and then after four weeks and two months. Corneal thickness was taken as point to assess corneal edema (CE) by slit lamp examination, and was compared by thickness of the other/ fellow eye. In milder form of CE we put those cases where iris details were cleared (with slight corneal thickness) and no descemet's fold. In moderate corneal edema we put those cases in which iris details were hazy (with increased thickness) and mild descemet's fold. Severe cases were those with iris and pupil not visible (more corneal thickness) with more descemet's folds. For this study state of cornea was noted in each follow-up. Average follow up was of 2 years.

RESULTS

Corneal problems encountered were divided into two groups. In one group we analysed problems during phaco. And in other group those which were faced after phaco. During phaco we have corneal abrasion in 40% of our cases (Table-II), long corneal tunnel was developed at first or probe entry site in 03 cases and in 02 cases it was at side port. Corneal hydration developed in 03 cases and detach-

Table-II: Corneal abrasion

<i>Site of abrasion</i>	<i>Percentage</i>
Fixation site	28%
Probe entry site	04%
Side port	03%
Inferior cornea by speculum	05%
Total	40%

ment of descemet's membrane in 03% of eyes. In 02 cases it was of the chopper which was directly touching the endothelium and in one case it was by phaco probe. We had corneal edema and striate keratopathy in 53% of cases (Table-III) as major problem after phaco. In each post operative followup CE was noted (Table-III). Usually corneal edema and striate cleared within one to three weeks time. In one case the cornea did not recover from edema and we have planned for keratoplasty.

DISCUSSION

Endothelium of cornea (EC) plays important role in the corneal transparency. Endothelium arranged in single layer and is non-healing. EC may be damaged during ocular surgeries. Measures should be taken to avoid damage to the EC. It was noted that endothelial cell loss was 7.1% at 3 years follow-up,¹² after phaco surgery. Apart from mechanical damage EC may be damage by the temperature of fluid inside the anterior chamber.¹³ During phaco temperature in the anterior chamber may be increased by various reasons which produce potentially dangerous heat which damages EC. Important factors include, vibration of the phaco tip and ultrasound power^{14,15} used. In one study the oxidative tissue damage of the corneal endothelium during phaco was found to be correlated with the ultrasonic energy applied.¹⁶ Mode of phaco applied during surgery is important, effect of continuous vs pulse and burst mode was studied and it was noted that serious corneal edema occurred more frequently in continuous group than that in the pulse and burst groups.¹⁷

Table-III: Corneal edema with and without Striate keratopathy

Degree of edema	Percentage			
	First post operative day	First week post operative	Fourth week post operative	Two months post operative
Mild	18.0	13.0	02.0	01.0
Moderate	22.0	10.0	01.0	Nil
Severe	13.0	03.0	Nil	Nil
Total	53.0	26.0	03	01

Whether supervised or unsupervised the complications of phaco procedure were more by the beginner than by experienced phaco surgeon. In our study we have analysed the corneal complications which we had in initial days or the learning stage of phaco. We had corneal abrasion in 40% of our cases. It occurred in 28% of cases at the fixation site opposite to the entry wound by the forceps. Being in the periphery it did not produce any problem and phaco procedure was continued. Those which occurred by speculum were small. Long tunnel in the cornea were noted in five cases where the knife went deep in corneal stroma. During phaco hydration in this long tunnel developed in three cases as the time of surgery was increased and produced problem of visualization.

Other complication was that of damage to the endothelium and detachment of descemet's membrane which occurred in 03% of cases. This was because of the direct damage by the chopper and phaco probe tip. Descemet's detachment was noted in 04% of cases of Popiela G et al.¹⁸

We have not assessed the EC by specular microscope and the assessment was done clinically by degree of corneal edema (CE) and striation. We presumed that with less damage to the endothelium, less edema and with more damage more severe CE would be there. It was backup by the one study where it was shown that corneal clarity was better in those cases where mean endothelial cell loss was minimal.¹⁹

CE and striate developed in 53% of our cases. It was mild in 18 cases and moderate in 22 cases. In 13% of our CE striate was severe enough to reduce the visibility of the iris. CE was in 20% of cases of Popiela G et al.¹⁴ Hashmani in his cases had this problem only in 5.3% of cases and it was only in 1.5% of cases of Khan AA et al.¹⁰ One of the important cause of CE in our cases was that in order to protect the posterior capsule the phaco-tip was kept in anterior chamber at iris plan which might have caused more temperature related damage to EC. As in-the-bag phaco of large

brown cataracts with crater-and-chop technique was without complications.²⁰

This was either because of the technique or in bag phaco. Other factor might be the viscoelastic used. We have used methylcellulose 2% in all cases. We have to observe the difference with the use of healon or better viscoelastic in term of post operative CE.

CONCLUSION

Along with other factors Phaco applied by keeping the phacoemulsification tip in anterior chamber might had produced lot of corneal edema post operatively and in order to lessen this problem we should apply phaco in bag.

REFERENCES

1. Durrani J. Helping the blind and the visually handicapped (but not by passing the Hat around. J Pak Ophthalmol 1996;12(3):77.
2. Memon SM. Prevalence and causes of blindness in Pakistan. J Pak Med Assoc 1992;42:196-8.
3. Durrani J. the land of paradoxes—where intracaps, extracaps, phaco and yes, couching coexist. J P Ophthalmol 1995;11(4):102-2.
4. Durrani J. Have emulsifier-will do phaco Can you spare an IOL? Pak J Ophthalmol 2000;16(4):142-3.
5. Kelman CD. History of phacoemulsification. In: Emery JM, Little JH. Phacoemulsification and aspiration of cataract. St Louis CV Mosby & company 1979:p 5-7.
6. Smeets B, Tabandeh H, Teimory M, Seward H. Learning phaco in a teaching environment. Bull Soc Belge Ophthalmol 1993;249:23-8.
7. Breusegem R. The nuclear cracking technique for the beginning phaco surgeon. Bull Soc Belge Ophthalmol 1993;249:29-32.
8. Hashmani S, Haider I, Khan MA. Phaco results and complications during the learning curve. Pak J Ophthalmol 1997;13(2):32-6.
9. Gavris M, Caciula D, Popa D, Caraus C, Capraru C, Kantor E, et al. Phaco—personal experience on my first 507 cases. Ophthalmologia 2004;48(1):48-52.
10. Khan AA, Azher N A, Chochan AM. Review of 100 cases of phacoemulsification Pak J Ophthalmol 1997;13(2):37-40.
11. Hepsen IF, Cekic O, Bayramlar H, Totan Y. Small incision extracapsular cataract surgery with manual phacotrisection. J Cataract Refract Surg 2000;26(7):1048-51.
12. Dholakia SA, Vasavada AR. Intraoperative performance and long term outcome of phaco in age-related cataract. Indian J Ophthalmol 2004;52(4):311-7.
13. Edelhauser HE, Ubels J. Cornea and the Sclera section 2 in Adler's physiology of the Eye clinical application (10th edition), Paul L. Kaufman & Albert Alm (Eds), Mosby, inc 2003;pp 47-114.
14. Can I, Takmaz T, Cakici F, Ozgul M. Comparison of Nagahara phaco-chop and stop-and-chop phaco nucleotomy techniques. J Cataract Refract Surg 2004;30(3):663-8.
15. O'Brien PD, Fitzpatrick P, Kilmartin DJ, Beatty S. Risk factors for endothelial cell loss after phaco surgery by a junior resident. J Cataract Refract Surg 2004;30(4):839-43.
16. Augustin AJ, Dick HB. Oxidative tissue damage after phaco: influence of ophthalmic viscosurgical devices. J Cataract Refract Surg 2004;30(2):424-7.
17. Liu YZ, Cheng B. Phaco using burst mode. Zhonghua Yan Ke Za Zhi 2004;40(4):239-42.
18. Popiela G, Markuszewska J, Chelstowska J, Szalinski M. Analysis of phaco complications during mastering of the method. Klin Oczna 2004;106(1-2):23-7.
19. Yang J, Lu Y. A clinical report on the use of burst mode phaco. Zhonghua Yan Ke Za Zhi 2005;41(1):27-30.
20. Vanathi M, Vajpayee RB, Tandon R, Titiyal JS, Gupta V. Crater-and-chop technique for phaco of hard cataracts. J Cataract Refract Surg 2001;27(5):659-61.