Phacoemulsification : our experience at a large Military Hospital

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Abstract

Cataract surgery by means of phacoemulsification was started at a large Military Hospital in March 2001. First 70 cases in whom phacoemulsification was performed between 15 March 2001 and 31 December 2001 were followed-up and evaluated. The surgical techniques used, complications and post-operative recovery following this new surgical technique have been discussed. Our experience of conversion from standard extracapsular cataract extraction to phacoemulsification has also been shared.

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Introduction

Cataract is the leading cause of curable blindness in our country. Over a period of time, cataract surgery has evolved tremendously. The improvement and refinement in cataract surgery is unparalleled due to advances in medical technology. Modern techniques have made the procedure safer, sutureless and predictable [1]. From traditional intra capsular cataract extraction (ICCE) to extra capsular cataract extraction (ECCE) with posterior chamber intra ocular lens (PCIOL) implantation and now phacoemulsification with foldable intra ocular lens (IOL) implantation, the progress in cataract surgery has been phenomenal [2]. Ophthalmic surgeons have had to upgrade themselves from performing ICCE with no magnification to phacoemulsification under operating microscope with both hands and both feet in use within a short span of just 10 to 12 years. The transition would be akin to the difference between riding a bullock cart and driving a sports car.

In the Defence Services, phacoemulsification was first introduced in late '90's at Armed Forces Medical College and at Army Hospital (R&R), New Delhi. Thereafter, phacoemulsification systems have been provisioned in all Command Hospitals and certain Zonal Hospitals. Service ophthalmologists have had to make rapid transition to this new technique which is state of the art technology the world over. This Military Hospital received the phacoemulsification system in March 2001. A prospective study was conducted on the first 70 cases upon whom phacoemulsification was performed. We wish to share our experience of this study.

Material and Methods

A prospective study was conducted in Eye Department of

this Military Hospital from 15 March 2001 to December 2001.

Patient Selection

Meticulous patient selection was carried out. All patients were examined in out patient department (OPD) under slit lamp after full pupillary dilatation. Patients having soft cataracts of Grade II or III were selected. Hard nuclei as judged by their brown/amber colour were excluded. Another important factor was pupillary dilatation. Only those pupils that could be fully dilated were chosen for phacoemulsification. Eyes with any other anterior segment disorder like glaucoma, uveitis, pseudoexfoliation, corneal opacity/dystrophy were not taken up for phacoemulsification. However, patients with quiescent posterior segment disorders like background diabetic retinopathy (BDR), branch retinal vein occlusion (BRVO), chorioretinitis, age related macular degeneration (ARMD), high myopia were taken up for phacoemulsification provided their anterior segments were normal. In all cases biometry was done.

The Procedure

All patients were operated by two ophthalmologists posted at this Military Hospital using similar techniques. Both ophthalmologists were already practising the procedures of continuous curvilinear capsulorexsis (CCC), hydrodissection and hydrodelamination in routine small incision ECCE with PCIOL. One of the ophthalmologists had some experience of doing phacoemulsification independently. All cases were performed under peribulbar anaesthesia (single point). After a limbus based conjunctival flap, a sclerocorneal tunnel was made with 3.2 mm disposable keratome. All sections were made in the superior part. CCC was performed in all cases. In mature cataracts 0.1% Trypan Blue hydrodissection and hydrodelineation were done till the nucleus could be freely rotated. A second entry was made by 1.5 mm disposable straight knife.

Phacoemulsification machine made by Storz, Protégé DPX 100 with Venturi pump system was used. Initial phacoemulsification power used for trenching was 30%-40%

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for hard nuclei and 20%-30% for soft cataracts with aspiration level of 50 mmHg. Two handed technique using “Y” nucleus rotator or dialer was used. For hard nuclei, Trench Divide and Conquer technique was used. For soft nuclei, Crater Divide and Conquer or Chip & Flip techniques were used [3]. A combination of these techniques was also used as dictated by the case. Once nucleus was split, the nuclear fragments were eaten in the bag or in the iris plane by switching over to pulse mode. Power was reduced to 20%-30% and aspiration was increased to 70 mmHg to increase holdability. 30° needle tip was used in all stages. A 15° tip was used in later cases of hard nuclei. A layer of epicortex was left behind to protect the capsular bag. Range of phacoemulsification was 1 to 3.5 minutes. The residual cortical matter and epinucleus was aspirated with Simcoe I/A canula manually. The fluid used was Ringer Lactate with 0.5 ml/ltr of 1:1000 adrenaline and 0.2ml/ltr Inj gentamycin mixed in the bottle. The section was enlarged with 5.5 mm disposable keratome and phacoemulsification profile single piece poly methyl methacrylate (PMMA), PCIOL of 5 mm optic was inserted into the capsular bag. In six cases, foldable PCIOLs were inserted. The section was closed with a single 10/0 nylon suture. At any stage, if the procedure was not progressing satisfactorily, it was converted to ECCE with PCIOL. Patients were discharged 2 days after surgery.

All patients who underwent phacoemulsification in this hospital were followed up for 10 weeks at this Eye Centre. Slit lamp examination was done at every visit. Glasses were given 6 to 8 weeks after surgery. Follow-up period ranged from 2 to 8 months.

Results

There was posterior capsular rupture with vitreous disturbance in 8 (11.4%) cases. The dreaded complication of nucleus drop occurred in only 2 of these cases. In other 6 cases, automated anterior vitrectomy was done. In 3 (4.2%) cases no intraocular lens implant could be placed. In 1 (1.4%) patient anterior chamber intra ocular lens (ACIOL) was implanted as the other was pseudophakic. In all other 66 (94.3%) cases PCIOLs were implanted, out of which 6 were foldable lenses.

On the first post-operative day, mild corneal oedema was seen in 10 (14.3%) cases. In 3 (4.2%) cases this required treatment with hyperosmotic eye drops (5% Sodium Chloride). In all cases, corneal oedema resolved completely by the time patient was discharged. In 5 (7.1%) cases with PCIOL implants, pupillary distortion due to haptic catch was observed. All other 61 (87.1%) cases with PCIOL had central circular and reacting pupil. 55 (78.6%) had vision of 6/12 and better with correction after surgery. 10 (14.3%) patients had final corrected vision between 6/18 and 6/24. Only 5 (7.1%) patients had final visual acuity of 6/36 or less. In 3 (4.2%) cases remnants of cortical matter were seen in early post-operative period. In 1 (1.4%) patient cortical matter at 12 o'clock could be completely removed. In all cases this did not create any further problem and ultimate visual acuity was good. 2 (2.8%) patients had posterior capsular opacification (PCO) within 3 months of surgery. 1 (1.4%) patient developed

capsular contraction syndrome. 1 (1.4%) patient came with iris prolapse 2 weeks after surgery. Post-operative refraction was done after 4 to 6 weeks of surgery. Only 5 (7.1%) cases required suture removal to correct excessive astigmatism ($> \pm 2.5D$). Post-operative astigmatism ranged from 0 to ± 3 D. The average astigmatism was ± 0.75 D. We did not have any case of machine failure.

Discussion

Out of 70 patients, 39 (55.7%) were males and 31 (44.3%) were females. Only 5 (7.1%) patients were serving defence personnel, the rest were ex-servicemen and dependants. The average age at time of surgery was 71.4 years. The youngest patient was a serving soldier with complicated cataract aged 37 years and the oldest patient was 78 years of age.

Intra-operative complications :

We did not experience any problems during sclero-corneal tunnel in our study. In 3 cases CCC wandered into the periphery. These cases were converted into ECCE with PCIOL and have been excluded from this study. In all cases large CCC of 5.5 mm was done. In almost 30% cases CCC was slightly eccentric or geographical, but this did not pose any problems during the procedure. This did not effect positioning of the IOL either. Various problems were faced during trenching. Nuclei of variable consistency posed the biggest problem - these nuclei are soft at the periphery and get harder towards the center. After initial easy trenching there was resistance unless phacoemulsification power was increased. In two cases, the hard nucleus began rotating freely and prolapsed into the anterior chamber (AC). One case was converted to ECCE with PCIOL while in the other, nucleus was pushed back into the capsular bag with viscoelastic and the procedure could be continued. Two cases of nucleus drop were encountered within the first 10 cases. Capsular rupture occurred while trenching [4]. In both cases, limited automated anterior vitrectomy was done and patients were referred to vitreo-retinal center of local Government Eye Hospital where vitrectomy with nucleus removal using LPFC was done (Table 1).

Table 1

Complications of phacoemulsification

Corneal oedema	10 (14.3%)
Posterior capsular rupture with IOL implant	5 (7.1%)
Nucleus drop	2 (2.8%)
Remnant cortical matter	3 (4.2%)
Posterior capsular opacification (PCO)	2 (2.8%)
Capsular contraction syndrome	1 (1.4%)
Iris prolapse	1 (1.4%)
Iris damage	3 (4.2%)

In two cases, there was PC rent while removing the

nuclear fragments. In these cases, sudden shallowing of AC was responsible for phacoemulsification probe touching the posterior capsule. In both cases, remaining cortical matter was removed using slow infusion rate and limited anterior vitrectomy was done. In both, PCIOLs were placed over the margins of rehxis; the IOLs were stable post-operatively and patients regained good visual acuity. In 2 cases there was PC rent during manual I/A. In both cases PCIOLs could be implanted and patients had good visual recovery. Our rate of posterior capsular rupture (11.3%) compares favourably with Dr. Ravi Thomas' series [6] in which rate of PC rupture was 10%. In 3 cases, iris was damaged due to being repeatedly aspirated into the phacoemulsification probe. In these cases, aspiration rate was reduced and iris was held back with the second instrument. In all cases, the procedure could be continued with good visual recovery. In one case there was thick posterior plaque which could not be removed by polishing. We feel that this patient, a case of high myopia had posterior polar cataract. Since we did not have experience with PCCC, this was left alone. 3 cases had residual cortical matter. Out of these, 2 had PC rents where incomplete cortical removal was deliberately done to restrict vitreous loss and preserve residual capsule. Incidence of posterior capsular opacification (PCO) has been low. Only 2 cases so far; however the maximum follow-up period has been only 8 months. As the follow-up time increases, this number is likely to go up. PCIOLs having normal one-piece, bi-convex configuration were used in this study. No IOLs with surface modification or modified edge designs were used.

Post-operative complications :

Following an uneventful phacoemulsification procedure, recovery was very gratifying. One patient had iris prolapse in the second week after surgery following a severe bout of bronchitis. Abscission with resuturing of wound was done. The patient had good visual recovery. One patient developed capsule contraction syndrome and phimosis of rehxis margins. YAG laser relaxing capsulotomy will be done if his condition deteriorates further.

Post-operative astigmatism, even with one suture and superiorly placed section has been less than after standard ECCE with PCIOL. Post-operative refraction was more stable and glasses were given as early as 4 weeks in certain cases. 5 cases had astigmatism $> \pm 2.5$ D. In these cases, suture was cut at 4 weeks with regression of astigmatism. Most patients had astigmatism between ± 0.5 D and ± 1.0 D with an average of ± 0.9 D. This was less than after ECCE with PCIOL.

55 patients (78.6%) had final corrected visual acuity

Fig. 1 : Post operative astigmatism

of 6/12 or better. 10 (14.3%) patients had final corrected visual acuity of 6/18 to 6/24. Out of these, 2 patients had astigmatism of $> \pm 2$ D. 6 (8.5%) patients had posterior segment disorders like BDR with CSME, ARMD and chorio-retinitis. One patient with ACIOL had poor vision due to anterior vitreous haze, one was a patient with posterior capsular plaque. There were 5 patients (7.1%) in whom visual acuity failed to be corrected better than 6/36; of these 2 were patients with nuclear drop. These patients, in addition to being aphakic also had vitreous haze and CME. One case with capsule contraction syndrome had poor vision. One patient had pre-existing vitreous haemorrhage due to BRVO and NVD also had poor vision. One patient had wet ARMD (Table 2). In a series of 70 cases by Dr. Ravi Thomas [6] vision of 6/12 or better was achieved in 94.8% cases. This was because they had excluded all cases with posterior segment pathologies from their study.

Table 2

Causes of poor post-operative visual acuity

Nucleus drop	2
Capsule contraction syndrome	1
BRVO with NVD+ Vit Hrge	1
Wet ARMD	1

Post-operative corneal oedema was seen in 10 (14.3%) patients. This was seen in patients where phacoemulsification time exceeded 3.0 minutes and is attributed to endothelial insult caused by dissipated phacoemulsification energy. In all patients this resolved with topical treatment and patients regained good vision.

It is said that the phacoemulsification learning curve is steep and slippery with vitreous. We can endeavour to make it less steep and amenable to learning. It goes without saying that a prospective phacoemulsification surgeon should be proficient with standard ECCE with PCIOL procedure and should be ambidextrous. The transition from ECCE to phacoemulsification should be

gradual and smooth. With our experience we would conclude the following :-

Before starting phacoemulsification, it certainly helps if the surgeon is familiar with steps of manual small incision cataract surgery like CCC, hydro-procedures and nucleus manipulation in the bag.

At the hint of any complication, the surgeon should be willing to convert. Learning should never be at the cost of patient's vision.

Before starting phacoemulsification, it is wiser to get on the job training by watching an experienced surgeon and the first 10-20 cases should be done under supervision.

Last but not the least, a back up of vitreo-retinal surgeon should be available in case of any eventuality.

Conversion from ECCE to phacoemulsification is a gradual process and has a long learning curve.

In the end, we would like to summarise that phacoemulsification has gratifying results for both the

patient and the surgeon, provided it is done judiciously in the beginning. A well performed ECCE with PCIOL is much better than a badly performed phacoemulsification.

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