Original article

Outcome of phacoemulsification in eyes with cataract and corneal opacity partially obscuring the pupillary area

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Abstract

Objective: To evaluate the intra-operative difficulties and postoperative visual outcome following phacoemulisification and intraocular lens (IOL) implantation in eyes with cataract and a coexisting corneal opacity partially obscuring the pupillary area.

Materials and methods: The study included 205 eyes of 205 patients with cataract, an extensive corneal opacity partially obscuring the pupillary area and a corrected distance visual acuity (CDVA) of less than 40/200 who had undergone phacoemulisification with IOL implantation by a single surgeon. The patients were followed up on day 1, day 7, 1 month and 3 months postoperatively. Intra-operative and post operative course and CDVA were evaluated.

Results: Seventy nine percent of the patients underwent phaco-emulsification via superior clear corneal approach while the rest were operated via temporal clear corneal approach. Trypan blue (0.06%) dye assisted capsulorrhexis was successfully completed in all eyes with additional maneuvers including posterior synechiolysis and sphincterotomy. Nucleotomy with primary chop technique and phacoemulsification were performed uneventfully in all but one eye, which was converted to an extra capsular cataract extraction (ECCE). A foldable intraocular lens was implanted in 76 eyes, rigid IOL in 128 eyes and 1 eye was left aphakic. The pre-operative CDVA of less than 40/200 improved to 20/60 at the end of 3 months follow up.

Conclusions: Phacoemulsification and intraocular lens implantation provides ambulatory and useful vision in eyes with coexisting cataract and corneal opacity.

Key words: corneal opacity, cataract, phacoemulsification, iris hook, sphincterotomy

Introduction

The triple procedure with Penetrating Keratoplasty (PK) (Gong X ,1990; Panda A, 1999; Rao SK, 1999; Shimmura S, 2003; Baykara M, 2008) or Lamellar Keratoplasy (LK) (Senoo T, 2001; Muraine MC, 2002) is the conventional mean for visual rehabilitation of an eye with corneal opacity and a coexistent cataract. Because of the risk of graft rejection and infections, these patients require a meticulous post-operative follow up. However, this may not be possible for patients who come from rural background and live in remote hilly areas. In developing countries, the availability of a good quality

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donor cornea is one of the greatest limitations. Ironically, the corneal problems usually require keratoplasty. Often, eyes with corneal opacities are associated with a co-existing cataract. Though a simple cataract surgery is not an alternative in these cases, it may be a good modality to provide ambulatory vision in one eyed patients, elderly patients with poor dexterity and those who are less likely to comply with a post-operative, meticulous follow up (Gupta AK, 1992; Panda A, 2007). With this in mind, we analyzed the results of our patients who were subjected to phacoemulsificaton and IOL implantation in eyes with cataracts and extensive corneal opacities partially sparing the pupil during the period from February 2000 - January 2010.

Materials and methods

A retrospective chart review was performed to evaluate the data of 205 consecutive eyes of 205 patients with cataracts and extensive corneal opacities partly obscuring the pupillary area and who were subjected to phacoemulsification with either foldable or rigid intraocular lens implantation by a single anterior segment surgeon (AP).

Only those cases in which the anterior capsule and the pupillary margin were visible with slit lamp bio-microscopy and the CDVA was less than 40/200 were enrolled.

A complete medical and ocular history was taken in all patients. A through ocular examination under a slit lamp was performed to obtain the details of the cornea and anterior chamber details. Intraocular pressure was recorded by applanation tonometer and fundus evaluation performed with an indirect ophthalmoscope. Laser inferometry, A- and B-scan ultrasonography for posterior segment evaluation and electrophysiological evaluations were carried out whenever required. The preoperative factors evaluated included etiology of the corneal opacification, the type of cataract and the pre-operative CDVA.

All the surgeries were performed under peribulbar lidocaine (Xylocaine 2%, Astra-IDL) and bupivacaine (Sensoricaine 0.5%, Astra- IDL) (1:1) anaesthesia. Pre-operative preparation of the surgery included use of tropicamide 1% three times every ten minutes for maximum dilation. Depending upon the availability of maximum clear cornea either superior or temporal site was selected for the incision. Synechiolysis with viscoelastics or with fine iris repositor, and multiple sphincterotomies were performed whenever indicated. Trypan Blue (Vision Blue, Dorc Int., Netherlands) 0.1mL of 0.06% was injected into the anterior chamber (AC), under air bubble to stain the anterior capsule for 10 seconds and then washed with balanced salt solution (BSS). High-viscosity viscoelastic (Sodium hyaluronate 14 mg/ml) was injected into the AC. Capsulorrhexis was initiated with a bent 26 G needle (Fig1a, 1b) but completed with Utrata forceps. The anterior capsule was grasped with Utrata forceps at the junction adjacent to the corneal opacity margin to ensure an adequate flap and firm hold (Fig.1c & 1d) The tearing of the capsule was continued in a single motion until it was visible at the other end of the opacity margin (Fig1e), then the rhexis was completed (1f). The viscoelastic was thoroughly washed from the AC followed by multiple quadrant hydrodissection in all until the edge of the nucleus tented in a clear area and was protruded outside the anterior capsule. Viscoelastic was injected behind and in front of the lens. A primary chop nucleotomy was performed (Fig 2a, 2b) followed by standard phacoemulsification. Care was taken to complete the phacoemulsification in the visible pupillary area by rotating the nucleus pieces to the maximum clear area (Fig 2c, 2d). Automated irrigation and aspiration of cortical materials was performed under retro-illumination at the visible area aided by posterior capsular trypan blue staining to complete the remaining cortex aspiration (3a).

In suspected cases of posterior capsule rupture either viscoelastic or 0.1 cc -4mg triamcinolone acetonide was injected into the AC to confirm the presence of any vitreous. An in-the-bag, foldable, single/three piece acrylic lens (Acrysof; Alcon Labs, fort Worth, TX, USA)/ Acrifold (APPA, India) or

rigid PMMA lens (APPA, India), was chosen for implantation as dictated by the patient's economic constraints (3b-3c). Remaining cortical matter, if any, was aspirated after dialing the lens in the bag. Viscoelastic was aspirated using automated irrigation and aspiration and the AC was formed with an air bubble. (3d-3e)

Post-operatively, the patients received Betametasone sodium phosphate eye drops (Betnesol, Glaxo) 0.1% 2 hourly and ciprofloxacin eye drops (Cifran, Ranbaxy) 0.3% four times a day. Cycloplegics were given to all and Timolol maleate (Iotim, FDC) 0.5% eye drops were added whenever required. The patients were followed up postoperatively on day1, week 1, month 1 and month 6.

Main outcome measures

The parameters assessed during surgery included the completion of capsulorrhexis, phaco-emulsification, irrigation and aspiration, intraocular lens implantation and the presence of complications, if any. Postoperative assessment included the record of corneal clarity, position of intraocular lens, CDVA and other complications, if any.

Results

The mean age of the patients was 52.85 ± 8.45years (range 42-67 years, males- 112, females- 93). Most patients (138) had corneal opacity due to healed keratitis (Table 1).

Table 1
Causes of corneal opacities

Causes	Frequency
Post-inflammatory	138
Post-traumatic	47
Post-surgery	13
Trachoma sequelae	7

The main incision used was the superior approach in 162 eyes. The temporal approach was used in 43 eyes. Additional maneuvers to enlarge the pupillary area included posterior synechiolysis (159 eyes) and additional sphincterotomy (63 eyes). The capsulorrhexis was successfully completed in all cases. No extension of the capsulorhexis occurred in any of the cases. A successful primary chop was possible in all cases. PC rent was suspected in fourteen eyes, which, however, were ruled out in five after injecting visco-elastic and five after injecting triamcinolone acetonide into the anterior chamber (AC) (Fig 4). In one eye, there was vitreous strand in AC, identified with triamcinolone acetonide and there was strong suspicion of nucleus instability in the bag. In this case, phacoemulsification technique was aborted and was converted to conventional extra capsular surgery (ECCE). The nucleus delivery was completed with wire vectis and the anterior vitrectomy was performed to clean the vitreous from the AC and wound, and the eye was left aphakic. In the remaining three cases, there was a small capsular tear. Rigid IOL was implanted successfully into the sulcus in those cases. The foldable intraocular lens (IOL) was implanted in 79, rigid IOL in 128 and one eye was left aphakic.

On postoperative day 1, there was residual cortical matter in the anterior chamber requiring re-aspiration in 5 eyes (Fig 5). Eleven eyes revealed grade II-III AC reaction which was controlled with intensive topical and systemic corticosteroid use (Fig 5). Pre op CDVA of <40/200 in all eyes improved to 20/200 (11), 20/120 (39), 20/80 (140) and 20/60 (11) at the last follow up (Fig 6). CDVA was dŠ 20/200 in rest 4 eyes. No infection or melting of any form was observed in any of the eye.

Figure 1 a & b: Anterior capsulotomy was started with bent 26 G needle atleast one-two clock hours away from corneal opacity margin and in relative clear area. 1a- diagrammatic representation, 1b- intraoperative photograph

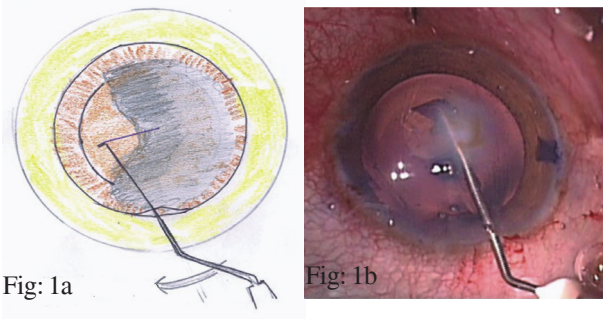
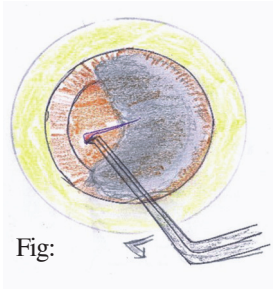


Fig: 1a Fig: 1b

Figure 1c, 1d: Re-grasp of the anterior capsule flap with Utrata forceps at the junction adjacent to the corneal opacity margin was done to ensure an adequate flap and firm hold



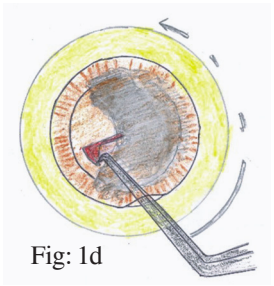
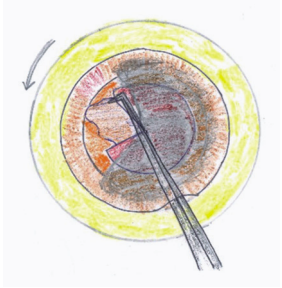


Figure 1e & 1f: The tearing of the capsule was continued at a single motion till it is visible at the other end of the opacity margin. 1e- diagrammatic representation & 1f intra-operative photograph



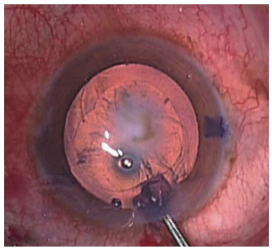
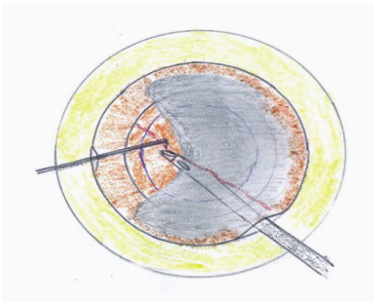


Figure 2a, 2b: Primary chop was performed in visible area



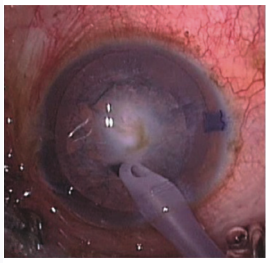
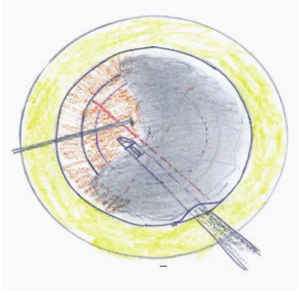


Figure 2c & 2d: Phaco-emulsification is done in the visible pupillary area by rotating the nucleus pieces to the maximum clear area



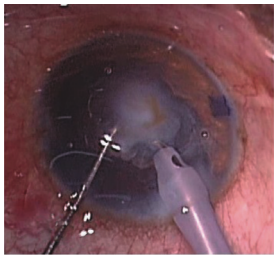


Figure 3a: Irrigation & aspiration

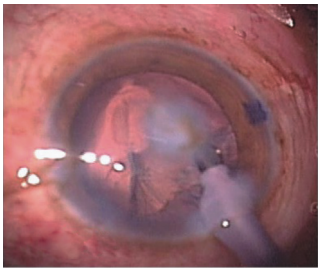


Fig 3b & 3c: Foldable IOL implantation in the bag

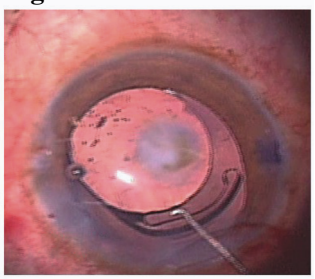


Figure 3d: Aspiration of the viscoelastic

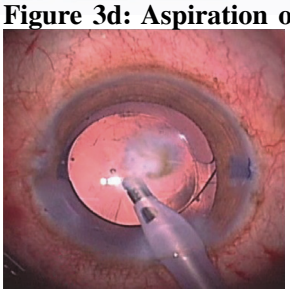


Figure 3e: Anterior chamber formation with the air bubble

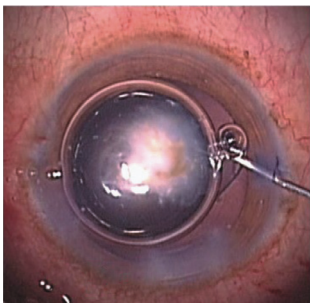


Figure 4: Diagram showing frequency of posterior capsular tear and management

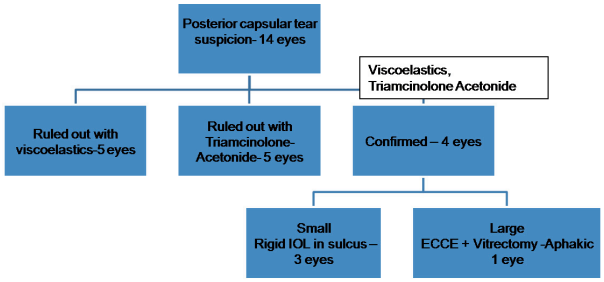


Figure 5: Diagram showing frequency of post-operative complications and management

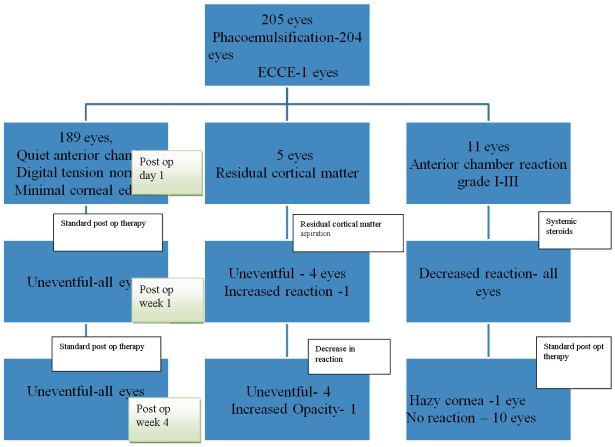
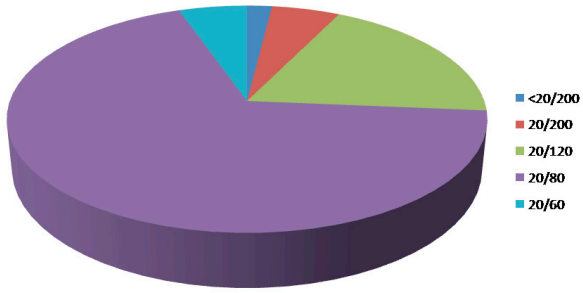


Figure 6: Pie chart showing postoperative visual acuity



Discussion

While modern cataract surgery is safe, effective and provides excellent visual outcome, this outcome may not necessarily be achieved in eyes with associated ocular problems or following complicated cataract surgery. In these cases, there is an increased risk of surgical complications and reduced visual outcome (Salem et al, 1987).

Meredith and Maumenee (1979) classified cataracts into 3 grades as determined by the surgical outcome. According to this classification, Salem and Ismail found 46.5% of patients belonged to group II and III in their study of which 41% had co-existent corneal lesions. Our experience is supported by their comments, which note a higher incidence of coexisting cataract and corneal opacity in developing countries. Thus, the triple procedure is required to rehabilitate these patients. Though the triple procedure (Gong X ,1990; Panda A, 1999; Rao SK, 1999; Shimmura S, 2003; Baykara M, 2008) is the method of choice to manage corneal lesions with a coexistent cataract, factors such as scarcity of good donor tissue, post keratoplasty graft rejection, glaucoma, and infection may impede the chances of successful penetrating keratoplasty (PK). This may be especially true in patients from rural areas in developing countries due to irregular follow up and poor ocular hygiene. Moreover, the patients with extensive corneal opacity are poor candidates for PK due to association of vascularisation and poor ocular surface as well as a high chance of developing post-operative suture related problems, which jeopardize the graft status. Thus, a simple technique is needed. Gupta et al (1992) and Panda et al (2007) advocate conventional ECCE to provide ambulatory vision in such eyes.

In modern era, phacoemulsification is the preferred technique of cataract surgery as it allows for early visual rehabilitation. However, a successful phacoemulsification may be difficult in eyes with corneal opacities because of poor visualization of intraocular morphology, and altered dynamics ((Farjo AA, 2003; Czumbel N, 2009; Chang YS, 2008). Surgical modifications, such as multiple sphincterotomy and iris hook application have been used to enlarge the visible papillary area and to overcome visual limitations. Use of dye, endoscope and Chandler illumination aided phacoemulsification also enhances surgical ease (Gregory ME, 2007; Sinha R, 2004; Uka J, 2005; Bhartiya P, 2002; Singh D, 1996). In the present study, we desired to make these patients ambulatory with cataract surgery alone by modifying the vital steps of surgery.

A fully dilated pupil allows visualizing the anterior capsule and capsular bag anatomy, so efforts are made to achieve this by breaking the posterior synechiae with additional sphincterotomies. This technique not only increases the visibility, but also helps improve post-operative visual outcome. The quality of peripheral vision may be expected to be sub-optimal when compared to central vision. However, Drew's and Drew's (1964) advocated optical iridectomy in eyes with obscured pupillary

zone. They argued that though the peripheral part of the human optical system does not form as sharp an image as the central part, the optical iridectomy improves visual prognosis because of the addition of peripheral bundle of rays. These peripheral rays help form a relatively clear image superimposed on the blurred image of the central part. However, in our study, we preferred multiple sphincterotomies instead of a complete iridectomy in order to preserve some functional anatomy of the iris. Although visual outcome in these eyes was suboptimal, all patients achieved ambulatory vision, enabling them to carry out daily activities. Anterior capsular staining was performed in all to demarcate the obscured capsular anatomy, to achieve a complete capsulorrhexis successfully and posterior capsular staining to enchance the safety of cortical aspiration in the presence of corneal opacities. Precision of capsulorrhexis by our technique enabled us to complete a successful circular capsulorrhexis. Making the nuclear border partially prolapsed from the bag by multiple site hydro-dissection, helped us to perform a successful primary chop in all. Either viscoelastic or triamcinolone acetonide injection into the anterior chamber (AC) aided the identification of vitreous in AC which was a boon for the decision of IOL insertion.

Conclusion

Phacoemulsification in selected cases of corneal opacities with cataract is safe and feasible both as a primary therapeutic option in cases where PK is risky because of various limiting factors.

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