

Phacoemulsification in a Rural Camp Setting: A Feasibility Report

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Abstract: *Introduction-* Generally, the method of choice for high volume cataract surgery in a camp setting is the Manual Small Incision Cataract Surgery. We assessed the feasibility of Phacoemulsification surgery for cataract patients identified in a rural camp. *Methods-* The present study was designed as a retrospective review of the hospital records of patients who underwent phacoemulsification in a rural camp. The surgery was performed by a single expert Phacoemulsification surgeon using foldable acrylic lenses. The details on various demographic and outcome related variables were collected. Descriptive statistics was used to analyze the data. *Results-* A total of 146 eligible patients were included in this study. Nearly 82.2% (120/146) had grade 2 nuclear sclerosis, followed by grade 3 (14/146, 9.6%), grade 1 (6/146, 4.1%) and only posterior subcapsular cataract (6/146, 4.1%). Intra-operatively, posterior capsular rupture was observed in 2/146 (1.4%) of the eyes. Post-operatively, 84 eyes had no complications whereas 56/62 (90.3%) had variable grades of corneal edema, 4/62 (6.5%) both corneal edema and anterior chamber reaction and 2/62 (3.2%) had only anterior chamber reaction. On the post-operative day 42, more than 90% patients achieved best corrected visual acuity of 6/9 or better. *Conclusion-* We noticed that phacoemulsification has low rate of intra-operative complications and very good visual outcome in the long run. Also, the procedure is feasible in a rural camp setting in the hands of expert Phacoemulsification surgeons.

Keywords: Phacoemulsification, Cataract, Rural Eye Camp, High Volume Cataract Surgery

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I. Introduction

Cataract has been the etiology for 50-80% of bilateral blindness in India[1]. Each year 10 million cataract surgeries are being performed globally and to eliminate blindness, 30 million surgeries need to be performed worldwide[2]. In many parts of the world, phacoemulsification is preferred than small incisional cataract surgery for the advantages of rapid visual recovery and low risk of astigmatism[3]. Phacoemulsification has been performed using mobile eye surgical unit and has been shown to be successful[4]. It is also known that the small incisional cataract surgery outperforms phacoemulsification in settings where there is a shortage of skilled ophthalmologists and limited resources and this scenario is applicable to India. In fact, a recent study from rural part of northern India has concluded small incisional cataract surgery being superior to phacoemulsification with rigid lenses for patients with cataract both in terms of visual outcome and complication rates[5]. However, in the absence of widespread evidence regarding the utility of phacoemulsification with foldable acrylic lenses in rural camp setting, the present study was carried out as a pilot study.

II. Methods

Study design and ethics

The present study was designed as a retrospective review of the hospital records. It was initiated after obtaining an overall approval and a waiver for obtaining informed consent from the study participants from hospital ethics committee.

Study methods

We retrospectively reviewed the hospital records of the patients who underwent phacoemulsification surgery for cataract in a rural camp at Barsana in Mathura District of Uttar Pradesh. Those having concomitant diseases like glaucoma, corneal opacity, previous eye surgery, nuclear sclerosis grade IV or harder nuclei were

not selected for phacoemulsification surgery. Phacoemulsification was performed by a single expert ophthalmologist under peribulbar anaesthesia and patients underwent clear corneal temporal approach phacoemulsification using stop and chop technique. Automated bimanual irrigation and aspiration was used. Foldable acrylic lens with 6 mm optic size was used. The 2.8mm incision was sealed by hydrating the wound without use of any suture.

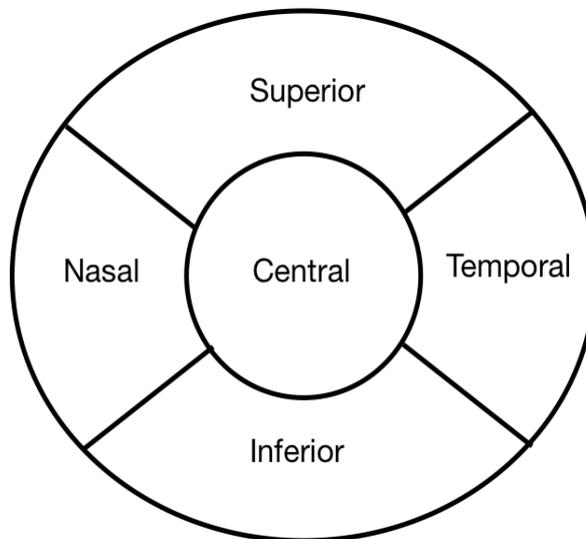
The following details were captured for each of the eligible patient: Intra-operative and post-operative complications; grade of corneal edema; zone of corneal edema; visual acuity on post-operative days 1, 4 and 42 and post-operative refraction. Descriptive statistics was used for analysis of all the above-mentioned variables.

III. Results

A total of 146 eligible patients were included in this study. Nearly 82.2% (120/146) eyes had grade 2 nuclear sclerosis, followed by grade 3 (14/146, 9.6%), grade 1 (6/146, 4.1%) and only posterior subcapsular cataract (6/146, 4.1%). A total of 102/146 (69.8%) eyes of all the above three types had an additional posterior sub-capsular component to their senile nuclear cataracts.

Intra-operatively, posterior capsular rupture was observed in 2/146 (1.4%) eyes. Post-operatively, on day 1, 84/146 (57.6%) eyes had no complications whatsoever. About 62/146 (42.4%) eyes were noted to have some complications of which 56/62 (90.3%) had variable grades of corneal edema/striate keratitis (SK), 4/62 (6.5%) both corneal edema/SK and anterior chamber reaction and 2/62 (3.2%) had only anterior chamber reaction. The distribution of zones of the corneal edema is depicted in Figures 1 and 2. Of patients with corneal edema, nearly half (26/60, 43.3%) had grade 2SK, 18/60 (30%) had grade 1 SK, 15/60 (25%) had grade 3 SK and 1/60 (1.7%) had grade 4 SK. Number of patients reporting corneal edema substantially decreased on post-operative day 4 to only 15 (15/60, 25%) and complete resolution was observed for all by the final follow up on day 42. The distributions of various categories of spherical refractive error and cylindrical refractive error on day 42 are mentioned in Table 1. The distribution of un-corrected and best corrected visual acuity on various post-operative days is mentioned in Tables 2 and 3.

Figure 1. Distribution of Zones of Corneal Edema



Schematic Zones of Cornea (shown for Left Eye)

Figure 2. Incidence and Distribution of Corneal Edema

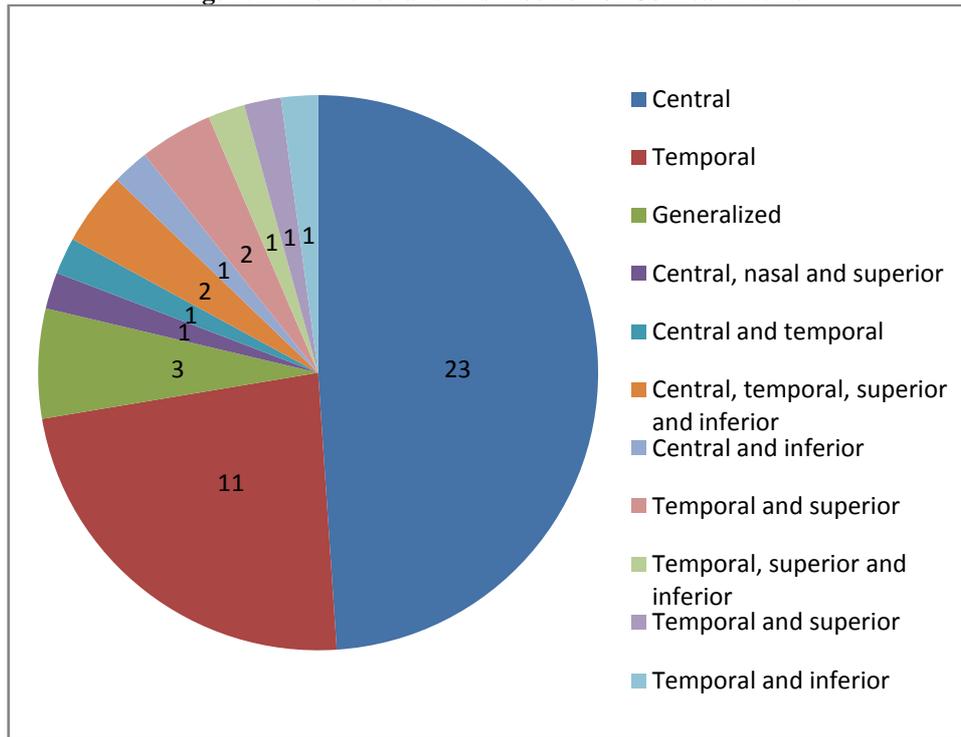


Table 1. Distribution of categories of refraction sphere, refraction cylinder and spherical equivalent

Parameter	Sub-class	Total number (%)
Refraction sphere	0	78 (53.4)
	0.25-1	44 (30.1)
	1.25-2	20 (13.7)
	2.25-3	4 (2.8)
Refraction cylinder	0	78 (53.4)
	0-0.25 D	30 (20.5)
	0.75-1 D	24 (16.4)
	1.25-1.5 D	7 (4.8)
	1.75-2 D	4 (2.8)
	2.25-2.5 D	1 (0.7)
	2.75-3 D	2 (1.4)
Spherical equivalent	0	45 (30.8)
	0.25-0.5	33 (22.6)
	0.75-1	37 (25.3)
	1.25-1.5	18 (12.4)
	1.75-2	3 (2.1)
	2.25-2.5	6 (4.1)
	2.75-3	4 (2.7)

Table 2. Un-Corrected Visual Acuity in the post-operative follow-up days

UCVA	Post-operative day 1 Total Number (%)	Post-operative day 4 Total Number (%)	Post-operative day 42 Total Number (%)
6/6	18 (12.3)	41 (28.1)	41 (28.1)
6/9	33 (22.6)	34 (23.2)	29 (19.8)
6/12	19 (13.0)	10 (6.9)	23 (15.8)
6/18	20 (13.7)	19 (13.0)	20 (13.7)
6/24	11 (7.5)	16 (10.9)	17 (11.6)
6/36	13 (8.9)	10 (6.9)	3 (2.1)
6/60	22 (15.1)	11 (7.5)	11 (7.5)
5/60	2 (1.4)	1 (0.7)	1 (0.7)
4/60	1 (0.7)	1 (0.7)	0
3/60	3 (2.1)	1 (0.7)	0
2/60	1 (0.7)	1 (0.7)	0
1/60	3 (2.1)	1 (0.7)	1 (0.7)

Table 3. Best Corrected Visual Acuity (BCVA) on 6 weeks follow-up

BCVA	Post-operative day 42 Total Number (%)
6/6	107 (73.3)
6/9	25 ((17.1)
6/12	7 (4.8)
6/18	3 (2.0)
6/24	2 (1.4)
6/36	1 (0.7)
3/60	0
5/60	0
4/60	0
3/60	0
1/60	1 (0.7)

IV. Discussion

Various studies have evaluated the utility of different cataract surgical techniques both in the hospital and camp settings in India. A study from hospital setting [7] in one of the pioneers in ophthalmology from South India revealed that with small incisional cataract surgery, the post-operative complications were extremely low and nearly 95% achieved a best corrected visual acuity of at least 6/18. Rao *et al* [6] reported that phacoemulsification was preferred over small incisional cataract surgery in rural areas of Nizamabad district in South India. However, this study showed a gradual drift in preference over many years in a non-camp setting. Ours is a high volume camp setup. To tackle the high backlog of needless blindness in India arising out of un-operated cataracts, many hospitals organize high-volume, short-duration cataract surgery camps in rural areas especially during the winter months. In such camps the preferred method of cataract surgery remains as Manual Small Incision Cataract Surgery popularly called as SICS. The other technique, namely the Phacoemulsification is not preferred as it takes longer time per surgery and is less cost-effective. Therefore, it is not so suited for high volume cataract surgery camp wherein many surgeries are to be done per day. To the best of our knowledge there has been no study in the published literature analyzing the feasibility of Phacoemulsification being employed in a set-up of high volume cataract surgical camp.

In the present study, we attempted to assess the feasibility of phacoemulsification for patients with cataract insurgical camp in rural India in 146 participants. A single expert phacoemulsification surgeon performed the surgeries over only three days with six surgery sessions lasting four hours apiece. Each surgery took an average operating time of 10.5 minutes only, making it approximately 6 surgeries done per hour. In the above quoted study [7] each surgery took an average of 3.75 minutes time with approximately 16 to 18 surgeries performed in an hour.

We observed a low rate of intra-operative complications, namely Posterior Capsular Rupture (PCR) in two eyes. In these eyes, only one eye had vitreous prolapse in which anterior vitrectomy was required. A rigid lens was implanted in the sulcus. In the other eye with PCR, there was no vitreous prolapse and foldable lens was put inside the capsular bag. There were several cases of post-operative corneal edema of variable grades of severity. Since the technique was a temporal clear corneal phacoemulsification, the edema and striate keratitis was mostly seen in the central and temporal zones. About 2/3rds of the cases (41/60) were grade 2 and 3 SK which were clinically significant. However, they showed complete resolution on subsequent follow-up visits. More than 90% of the study participants achieved best-corrected visual acuity of 6/9 or 6/6 eventually. When we looked at the post-operative refraction data after six weeks, we noted that 78 eyes (53.4%) required no cylindrical power correction at all. Further, another 53 eyes (36.3%) required 1D or less of cylindrical correction. This can never be the case even with carefully done SICS surgeries as the usual technique inherently induces a significant astigmatism in most cases in the range of 1D to 1.5D. [10] The rural patients in this Phacoemulsification surgical camp could gain the advantage of lesser astigmatism and hence better unaided visual acuity. Around 113 eyes (77.4%) had UCVA of 6/18 or better. Also, the foldable acrylic lenses used in Phacoemulsification have an edge over the Rigid PMMA lenses used in SICS surgery in imparting superior visual functions [11] and having lesser rate of Posterior Capsular Opacification. [12]

The major downside to phacoemulsification is the cost involved with the procedure. A study from India reported that the cost of a small incisional cataract surgery was USD \$15.34 compared to phacoemulsification surgery which costs USD \$42.10. [8] However, recently with subsidiaries from various sources and depending on the lens preferred by the patients, an Indian hospital is able to offer phacoemulsification surgeries with a price ranging between USD 41 and 125. [9] The present study is limited in not having evaluated the cost of surgery.

To conclude, we observed that in the hands of an expert surgeon, phacoemulsification is associated with good final visual outcome and is feasible to be performed in rural camp setting in India.

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Conflict of interest

The authors do not have any conflict of interest.

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