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Longitudinal study on visual outcome and spectacle use after intracapsular cataract extraction in Northern India

Sanjeev K Gupta*[1], GVS Murthy[1] and Namrata Sharma[2]

Address: [1]Community Ophthalmology, Dr. Rajendra Prasad Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, India and [2]Dr. Rajendra Prasad Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, India

Email: Sanjeev K Gupta* - comoph@ndfvsnl.net.in; GVS Murthy - comoph@ndfvsnl.net.in; Namrata Sharma - namrata103@hotmail.com

* Corresponding author

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Abstract

Purpose: More than 3 million cataract extractions are undertaken in India annually. Almost 60% of these operations are intracapsular Cataract Extractions. The subsequent optical correction is provided by aphakic spectacles. The aim of this study is to assess visual outcome and perceived benefits of post-operative use of aphakic spectacles.

Methods: One hundred and sixty-seven persons who had undergone intracapsular cataract extraction and had been given best corrected aphakic spectacles were evaluated one year following prescription of the best corrected aphakic spectacles. Out of these, 82.6% were re-examined in this interview-based longitudinal study.

Results: The mean age of the male participants was 65.95 years and that of females was 71.26 years. 81.2% of the participants were using the provided spectacles. There was no significant association between the spectacle use and gender of the participant. The commonest reason stated by the respondents, for the non-use of the spectacles was 'poor vision'. 61.7% of the current users of provided spectacles had a visual acuity of 6/18 or better. 91.1% of the current users were very satisfied with the spectacles. All the current users could now manage personal activities and the spectacles had facilitated independent mobility. There was no difference in the level of satisfaction between mono-aphakics and bi-aphakics. Among the satisfied users, the modal spherical power was +10 D followed by + 11 D. About one-third of these required a cylindrical correction.

Conclusion: Following intracapsular cataract extraction, provision of the best correction after cataract surgery is desirable to obtain an optimal visual outcome.

Background

An estimated 38 million individuals are blind worldwide, who cannot count fingers at a distance of 3 meters with the better eye and with the best possible correction [1]. India accounts for more than 6 million of the above estimate. Cataract alone is responsible for 80% of the blindness in India [2].

More than 3 million cataract extractions are being undertaken in the country annually. Almost 60% of these operations are intracapsular cataract extractions (ICCE)

performed in temporary eye camps in rural and peri-urban areas, where the population is unable to have access to fixed eye care facilities [3]. The subsequent optical correction is provided by the use of aphakic spectacles which may be given as standard power of +10 to + 12 Dioptres or the exact prescription of the same may be given.

There is paucity of studies on the actual outcome of intracapsular cataract extraction, especially on a long-term basis. Most of the available literature on spectacle use relates to the use of the standard aphakic spectacles rather than the use of best-corrected spectacles.

Hence we undertook this study to evaluate the visual outcome and the perceived benefits following the use of best-corrected aphakic spectacles after intracapsular cataract extraction.

Methods

In this preliminary study, which was undertaken one year ago, the best corrected aphakic spectacles after refraction had been provided to 167 patients who had been operated by intracapsular cataract extraction earlier. These patients had undergone intracapsular cataract extraction four years prior to the study either at an eye camp or at a base hospital in the rural areas and urban slums of north India and were selected randomly. The best-corrected aphakic spectacles had been given to them in place of the standard aphakic spectacles, which were dispensed following intracapsular cataract extraction. The cohort was spread over ten villages in District Faridabad of the Haryana State and the urban slums of Delhi.

The inclusion criteria for being recruited to the study were: the patient was operated by intracapsular cataract extraction either at any eye camp or at a base hospital within the past four years and the best corrected visual acuity of the patient was 6/60 or better. The cut off point of 6/60 was taken as per the definition of blindness in our national program. Further this would eliminate causes other than uncorrected aphakia, which may be responsible for diminution of vision such as glaucoma, dense central corneal opacities, complications of cataract extraction and posterior segment pathology. Both bilateral and unilateral aphakes were included in the study.

The present study was conducted in four steps: Step I – Identification and training of the personnel, pre-testing of the questionnaire and preparation of the list of the participants. Step II – Domiciliary visits to identify the patients and announce the time schedule. Step III – Clinical examination, patient interview and data analysis. Step IV – Distribution of the spectacles.

The database prepared in the preliminary study conducted one year ago was used to identify the patients who had been prescribed best-corrected aphakic spectacles. The participants were contacted through domiciliary visits. A pre-tested semi-open-ended questionnaire schedule was administered (Appendix 1). This type of questionnaire, called an interview schedule was necessary, as most of the participants of the study were illiterate. The investigator himself (SKG) filled the questionnaire. Care was taken not to ask any leading questions. The spectacle frames were examined for any cracks or repairs and the lenses were checked for any scratches. Information pertaining to the use of provided spectacles, their perceived benefits and level of confirmed beneficiary satisfaction was elicited. Refraction was carried out by a trained optometrist with an experience of conducting more than 25000 refractions in camps organized by the base hospitals. The optometrist confirmed the power of the provided spectacles with the use of a lensometer. The visual outcome was assessed for each eye using Snellen's E-chart placed at a distance of 6 meters, as most of the participants were illiterate.

Data analysis

The data was analyzed using EPI INFO package, version 6.0. The questionnaire was prepared in the EPED menu of EPI INFO. The coding of the questionnaire was done in the first step of the study itself.

The participants who did not have spectacles or who needed a change were prescribed and distributed new spectacles.

Results

For the purpose of this manuscript the best corrected spectacles, which had been given to the participants, one year ago would be referred to as the provided spectacles. Of the 167 patients who were provided spectacles, 25 were lost to follow-up (13 females and 12 males) and four claimed that they had not received the aphakic spectacles, and were excluded from further analysis (Table 1). Thus, numbers of patients examined for this study were 138 (82.6%) of the original 167 recruited to the study. Reasons for loss of follow-up included 5 deaths, 5 migrations, and 11 out-of-station and 3 bedridden (terminally ill) patients. The 11 participants who were out-of-station were scattered over 6 villages.

Demographic features

Out of a total of 138 participants, there were 57 males (41.3%) and 81 females (58.7%). One hundred and twenty four participants out of 138 (89.8%) were aged more than 60 years. The mean age of the males was 65.9 years and that of females was 71.3 years.

Table 1: Visual acuity of eyes of participants who were using the provided spectacles and had no change in current prescription

	Current visual acuity		Total
Visual acuity one year ago	**6/18 or better**	**Less than 6/18**	
6/18 or better	87	2	89
Less than 6/18	0	52	52
Total	87	54	141

Visual outcome

Out of the 138 participants who were followed, 37 were bi-aphakic and the remaining 101 were mono-aphakic. The 138 participants thus contributed to a total of 175 operated eyes. The mean duration since intracapsular cataract extraction of the first eye was 32.0 ± 24.9 months and that of the second eye was 20.4 ± 13.1 months. Of the 138 participants who were examined and interviewed 113 were using the provided spectacles and 25 participants were no longer using the provided spectacles. The 113 participants who were currently using the provided spectacles contributed to 141 operated eyes. Amongst the 141 eyes, 7 eyes had deterioration in the visual acuity by one line on the Snellen's chart during the follow up period whereas the remaining 134 did not show any change in the visual acuity. Of these 141 operated eyes, 87 (61.7%) eyes had a visual acuity of 6/18 or better on both the occasions i.e. one year ago and during the present study, two eyes who had a visual acuity of 6/18 or better one year ago now had a visual acuity of less than 6/18 and 52 eyes had a visual acuity of less than 6/18 on both the occasions i.e. one year ago and during the present study. However, refraction of each eye confirmed that none of the 138 participants required a change in the spectacle power at the time of follow up.

The 25 participants who were not using the provided spectacles contributed to 34 operated eyes in the study. Out of these 34 eyes, all the 17 eyes which had a best-corrected vision of 6/18 or better one year ago still had a visual acuity of 6/18 or better. Of the remaining 17 eyes, three eyes of two participants had a current visual acuity of less than 3/60 as one of the participants had developed bilateral retinal detachment and the second had developed a dense central corneal opacity during the previous year.

Spectacle use and perceived benefits

Of the 113 patients who were using the provided spectacles, 112 (99.1%) were using them all the time and only one patient was using them occasionally. The 25 patients discontinued the use of the provided spectacles sometime during the one-year follow-up period. Twenty-two of these 25 patients had replaced them with other spectacles and the remaining three did not replace them and had uncorrected aphakia. There was no significant association between gender and the use of provided spectacles (χ^2 = 0.14: p = 0.71) (Table 2).

The most common reason stated for the non-use of the provided spectacles by the respondents was 'poor vision' (Table 3). Other reasons included were breakage of the spectacle pairs, dizziness due to spectacles, an ability to see better with the unoperated fellow eye (which had immature cataract) and loss of spectacles. The duration of use of the provided spectacles was less than one month in 17 (68%) of these 25 patients who discontinued them because of 'poor vision' or 'dizziness'. The remaining 8 patients discontinued the use after 2–10 months.

Out of a total of 135 spectacles examined by the investigator, 122 (90.4%) spectacles in current use were in good condition, 11 (8.2%) had scratches on their lenses and one each had a broken lens or frame.

Out of 113 participants who were using the provided spectacles, 91.1%(103/113) stated that they were 'very satisfied' with the results of cataract surgery (Table 4). This percentage was much higher as compared to the 77.3% participants (17/22) who were using their own spectacles. 8.0% (9/113) of the users of provided spectacles and 9.1% (2/22) of those using their own spectacles were 'marginally satisfied'.

Of the three subjects who were not using any spectacles at present, two were very satisfied with the cataract surgery till their spectacles were lost or broken. The third was no satisfied, as vision did not improve. He did not use the spectacles as he could see better with the fellow eye, which had am immature cataract.

When asked about the comparative effect of the provided spectacles on vision, vis-à-vis the standard spectacles they were using before the commencement of the preliminary study, 81.2% (112/138) stated that the provided spectacles had greatly improved their vision. However 3.6% (5/

Table 2: Distribution of spectacle use with respect to sex

	Using provided spectacles	Not using provided spectacles	Total
Male	48 (84.3)	9 (15.7)	57 (100)
Female	65 (80.2)	16 (19.8)	81 (100)
Total	113	25	138

Table 3: Level of satisfaction after cataract surgery

Level of satisfaction	Using provided spectacles	Using other spectacles	Not using any spectacles	Total*
Very satisfied	103 (91.1)	17 (77.3)	2 (66.7)	122 [88.4 (81.9–93.2)]
Marginally satisfied	9 (8.0)	2 (9.1)	0	11 [8.0 (4.1–13.8)]
Not satisfied	1 (0.9)	2 (9.1)	1 (33.3)	4 [2.9 (0.8–7.3)]
Unhappy as vision worsened	0	1 (4.5)	0	1 [0.7 (0.02–4.0)]
Total	113 (100.0)	22 (100.0)	3 (100.0)	138 [100.0]

*Figures in parenthesis are percentages

Table 4: Perceived benefits from the use of aphakic spectacles

Perceived benefit	Using provided spectacles n = 113	Using other spectacles N = 25	Total* n = 138
Can manage all personal activities	113 (100)	19 (76)	132 [95.7 (90.8–98.4)]
Has facilitated independent mobility	113 (100)	18 (72)	131 [95.0 (89.8–97.9)]
Can recognize family members and cattle clearly	102 (90.3)	17 (68)	119 [86.2(79.3–91.5)]
Has improved economic potential	5 (4.4)	0	5 [3.6 (1.2–8.3)]
Surroundings better visible but hazy	1 (0.9)	1 (4)	2 [1.4 (0.2–5.1)]
Has not helped in any fashion	0	5 (20)	5 [3.6 (1.2–8.3)]

*Figures in parentheses are percentages

138) maintained a slight improvement, 2.9% (4/138) found no difference, another 2.9% (4/138) felt it had slightly worsened their vision, 6.5% (9/138) found that their vision had been greatly worsened, and 2.9% (4/138) were unable to offer an opinion.

A comparison between the level of satisfaction between the mono-aphakics and the bi-aphakics did not reveal any difference. 88.5% (77/87) of the mono-aphakics and 88.2% (45/51) of the bi-aphakics were 'very satisfied'. This could be because majority of the mono-aphakics probably had cataract in the other eye, of sufficient density to cause a significant impairment of vision.

An inquiry into the perceived benefits from the use of aphakic spectacles revealed that most (95.7% -132/138) participants could now manage all personal activities, 95.0% (131/138) felt that it had facilitated independent mobility and 86.2%(119/138) stated that they could now recognize their family members and cattle clearly (Table 5). Only 5 participants (3.6%) felt that it had helped in improving their economic potential. However, 1.4% (2/138) found that the surroundings were visible better but hazy and 3.6% (5/138) felt it had not helped them in any fashion.

The percentages of the perceived benefits were higher among those still using the provided spectacles than those who had replaced them (Table 5). All the participants using the provided spectacles could now manage all personal activities and claimed that the spectacles had facilitated independent mobility. 90.3% (102/113) stated that they could now recognize family members and cattle clearly. The corresponding percentages among those who had replaced the provided spectacles were 76%, 72% and 68% respectively. However none of the participants using the provided spectacles stated that it had not helped them in any fashion as compared to 20% (5/25) of those who were using other spectacles.

All the spectacles were examined with a lensometer. This confirmed that all the participants who claimed that they were using the provided spectacles were indeed using them. And the others were indeed, using some other spectacle pairs purchased by them.

An analysis of the spherical power of the corrective lenses for the eyes of those who were still using the provided spectacles revealed that, though +10D is still the modal power (42.6% -60/141), a spherical correction of +11D is not far behind accounting for more than over a quarter (28.4% -40/141) of the eyes (Table 6). Thus the two together account for 71.1% (100/141) of the participants'

Table 5: Distribution of spherical and cylindrical power in the provided spectacles which were still being used

Spherical Power (+D)	Cylindrical Power (+D)	Number of eyes	%
10.00	No cylinder	34	24.1
11.00	No cylinder	27	19.2
10.00	With cylinder	26	18.5
11.00	With cylinder	13	9.2
9.00	No cylinder	11	7.8
12.00	No cylinder	9	6.4
Others (each in less than 5 eyes		21	14.8
Total		**141**	**100.0**

eyes. The range of the spherical powers was +7.50 D to +16.00 D. This has far-reaching implications as currently, most of the patients undergoing intracapsular cataract extraction in India are being provided standard + 10D spherical correction with no cylindrical correction or refraction.

A perusal of the cylindrical correction among the same 113 participants (141 eyes) who were still using the provided spectacles found that 36.2% (51/141) eyes required a cylindrical correction as well. The modal cylindrical powers were +2.00 D (47.0% -24/51) and +1.00 D (43.1% -22/51). The range was +1.00 D to +3.00 D (Table 7).

Discussion

Intracapsular cataract extraction has been the commonest mode adopted in eye camps in India. Intracapsular cataract extraction has been thought to be appropriate in terms of technology and is cost-effective in terms of time, resources and manpower, for use in developing countries with limited resources [4,5].

With the advent of the technologically superior extracapsular cataract extraction with posterior chamber intraocular lens implantation (ECCE + IOL), there has been a lot of pressure to change this modality in developing nations because of the better visual outcome with this procedure [6]. Eventually, extracapsular cataract extraction with lens implant may replace intracapsular cataract extraction with aphakic spectacle correction. However, in a vast and developing country like India, with its huge backlog of unoperated cataract patients and their predominant rural habitat, this is likely to take a substantial time.

It is also important to consider the visual needs of the population and their level of satisfaction with intracapsular cataract extraction before deciding on whether this modality should be discontinued.

Very few studies are available on the actual outcome of intracapsular cataract extraction, especially on a long-term basis [7]. Most of the available literature on spectacle use relates to the use of the standard aphakic spectacles.

The vast majority of the participants (81.2%) were still using the best-corrected aphakic spectacles, which were provided to them one year ago. All but one of the 113 participants was satisfied with them. This figure compares favorably with the satisfaction rate of 70% with the standard aphakic spectacles as has been demonstrated in earlier studies from northern India [8,9]. The frequency of the use of the best corrected spectacles was much higher (91.1%) amongst the participants using the provided spectacles as compared to those using the spectacles purchased by them (77.3%). However, it is conceivable that those using 'other spectacles' were doing so because they were perhaps not satisfied with the provided spectacles. Another study in India also found a high incidence of spectacle use [2], although a follow-up study in Nepal documented that only half of the operated patients were actually using the aphakic correction [10].

Quality control in the selection of the aphakic spectacles is very important. The spectacles in the current study were provided of sheet acetate frames and white English lenses. Breakage of the spectacles and their subsequent non-replacement is considered to be one of the disadvantages in ICCE. In the present study, with good quality spectacles, only 4.3% of the participants reported breakage after one-year use. However, the condition of the spectacles was found to be good in 90.4% of the participants.

All the participants who were using the provided spectacles stated that they could now manage all personal activities and that the spectacles had facilitated independent mobility. However, only a small proportion was actually rehabilitated economically. The above results with the general satisfaction of the majority of the participants adds credence to the view that excellent vision for improving economic potential is not a felt need of the rural population in developing country like ours. Improved mobility, ability to undertake personal activities and recognition of family members, friends and cattle are more important in the context of rural India. This can be adequately achieved by aphakic correction with spherical and cylindrical refraction in most cases.

Amongst the users of the provided spectacles who were satisfied, 61.7% of the eyes had a visual acuity of 6/18 or better. We have earlier reported a lower percentage (44.7%) of satisfaction rates for visual acuity of 6/18 of better with the use of standard aphakic spectacles in a socio-epidemiological assessment after camp-based intracapsular cataract extraction in villages and peri-urban

areas in north India [9]. In the present study, when asked about the comparative effect of the provided spectacles on vision, vis-à-vis the spectacles they were using before that, 81.2% of the participants stated that the provided spectacles had greatly improved their vision. Thus, it appears that the aphakic spectacles after complete spherical and cylindrical correction provide a better visual outcome than the standard +10D spherical correction.

However, there are a few sources of bias in our study. We have excluded the patients who have a visual acuity of < 6/60 some of which may occur due to results of the complications of surgery. Further, it is also possible that the 11 patients who were out station (and hence we were unable to assess their visual acuity) were perhaps more mobile due to a better visual acuity. Although care was taken not to ask leading questions, the possibility that participants out of their natural politeness may have exaggerated their satisfaction to please the interviewer, cannot be ruled out. The historical comparison within each participant's experience may also introduce a bias. A randomized controlled trial is required to address this issue.

Nevertheless, our study suggests that the distribution of standard +10D spherical spectacles is inadequate, in terms of provision of best vision to the acceptors of intracapsular cataract surgery. The wide range of powers accepted by the participants necessitates proper refraction at six weeks post-operatively and provision of good quality spectacles of correct power. However, this would require another visit by the patient to the campsite for receiving the best-corrected aphakic spectacles and will also incur additional costs. It is likely that a patient who has come twice before, once for the surgery and the second time for removal of sutures will be willing to come again if he knows that the new pair of spectacles will provide him with better vision than the standard +10D spherical spectacles which are dispensed at the time of suture removal, 4–6 weeks operatively.

Conclusions

Thus we concluded from the study that following intracapsular cataract extraction, the provision of the best correction after cataract surgery is desirable to obtain an optimal visual outcome.

Competing Interests

None declared.

Authors' Contributions

Sanjeev K. Gupta : Instituting of the study, Collection of data, Data Compilation

G.V.S. Murthy : Data compilation and data analysis

Namrata Sharma: Data analysis and preparation of manuscript

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