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Visual Outcome in Senile Cataract with Multifocal and Unifocal Intraocular Lens

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Abstract*: The aim of the study was comparison of multifocal IOLs with the current standard mono-focal IOLs in Senile Cataract undergoing surgery with phacoemulsification in respect to visual acuity (uncorrected and best corrected for both distant and near).*
Materials and Methods: *This was a prospective randomized study at Sarojini Devi Eye Hospital, Hyderabad from September 2013 to September 2014, in 50 patients of senile cataract. The study group was divided randomly into two groups with 25 patients in each group. All the in the study group underwent phacoemulsification with implantation of IOLs of Monofocals in the first group of 25 eyes of 25 patients and Multifocals in the second Group 25 eyes of 25 patients.* ***Results:*** *Age of these patients ranged from 50-70 years. Majority of the patients in monofocal IOL group were 61-65 yrs (32%) whereas 56-60 years (40%) in multifocal IOL group. In monofocal IOL group 13(52%) were male and 12(48%) were female. In multifocal IOL group 15 (60%) were male, and 10(40%) were male. Postoperatively, UCDVA of > 6/9 was in 11 (44%) of monofocal group and in 10(40%) of multifocal group and BCDVA was in 20 (80%) monofocal IOL group and in 21(84%) multifocal group at the end of Ist weekPostoperatively.*BCDVA of > 6/9 at end of 1st week post-op was in 23 (92%) patients of monofocal IOL group and in 24(96%) of multifocal group. BCDVA of 6/6 at the end of 6 week, monofocal was 80%,in multifocal was 96%.But UCNVA-*15(60%) patients had > N12 (mean 0.2 logMAR) in the monofocal IOL group and 25(100%) patients had UCNVA > N12 (mean 0.01 logMAR) in the multifocal group, which was statistically significant with a P value of 0.001.****Conclusions:*** There was no significant difference in uncorrected distant visual acuity post operatively in both the groups *There was a significant difference in the uncorrected near visual acuity. There was no difference in the corrected near visual acuity in both the groups.*

Keywords: *Uncorrected Distant visual acuity (UCDVA), Best corrected Distant visual acuity (BCDVA) Uncorrected Near visual acuity (UCNVA), Best corrected Near visual acuity (BCNVA), Intraocular Lens (IOL), Multifocal and Unifocal*

I. Introduction

Many people in their later years in life suffer a severe visual handicap due to the loss of adequate near vision. The initial use of single power spectacles followed by the popularity of bifocals has greatly enhanced the lives of presbyopic patients. However, the nuisance of spectacles for correction of presbyopia has remained somewhat elusive. Cataract surgeons have been making steady progress in improving near vision IOL's and newer operative techniques with improvements in IOL power calculations and the reduction of post-operative astigmatism. Patients are now enjoying and even expecting, better unaided distance and near vision after cataract removal. Today's cataract surgeons have a number of modalities to restore unaided near vision.

Multifocal IOLs, which claim to allow good vision at a range of distances, are capable of correcting refractive errors as well as eliminating patients need for near vision addition. There are reports that multifocal IOLs are responsible for some degrees of halo, glare, and reduced contrast sensitivity.[5,6,7.] Nonetheless, patients seem to be very satisfied with these lenses. Meanwhile there is the emergence of different contrasting reports regarding the efficacy of multifocal IOLs, its side effects and patients discomfort. Hence a need automatically arises to study their efficacy. In the current study, we present a comparison of monofocal IOL and multifocal IOLs in terms of near and distance visual acuity (VA) and contrast sensitivity.[5]

II. Aims And Objectives

The aim of the study was comparison of multifocal IOLs with the current standard mono-focal IOLs in Senile Cataract with phacoemulsification in respect to visual acuity (uncorrected and best corrected for both distant and near).

III. Methods And Materials

This was a prospective randomized study conducted at Sarojini Devi Eye Hospital, Hyderabad from September 2013 to September 2014, consists a total of 50 patients with senile cataract requiring cataract surgery, divided randomly into two groups, 25 patients in each group. In the first group 25 eyes of 25 patients underwent phacoemulsification with monofocal intraocular lens implantation and in the second Group 25 eyes of 25 patients underwent phacoemulsification with multifocal implantation.

Inclusion criteria:
1) Patients with senile and pre senile cataract without any other ocular pathology
2) Patients not having inclination to near post operative glasses.

Exclusion criteria:
1) Complicated cataract
2) Eye disease either systemic disorders like glaucoma, diabetes, retinal pathology.

Pre-operative evaluation:
Uncorrected distance visual acuity (UDVA) and corrected distance visual acuity for all the patients admitted in hospital a day prior to surgery Anterior segment evaluation under slit lamp Fundus examination using slit lamp biomicroscopy and direct ophthalmoscopy IOP measurement by Goldmann's applanation B-Scan where required Systemic evaluation for diabetes, hypertension etc.
IOL power calculation by keratometry and A-Scan biometry using the SRK T formula[4] Follow up on first operative day and in every week for 6 weeks.
Snellen chart distant visual acuity on 1st day and every week for 6 weeks post operatively.
Near vision acuity (NVA) after corrected DVA using Snellen near vision test types
The visual acuity is converted into log MAR for statistical analysis and is presented in decimal scale.

Pre operative preparation
Instillation of Ciprofloxacin eye drops started day before the surgery (8-10 times /day) and stopped one hour before surgery. The pupil was dilated with Cyclopentolate 1%, Tropicamide 1% and Fluribprofen 0.03 used 3 times in one hour for two hours before surgery.

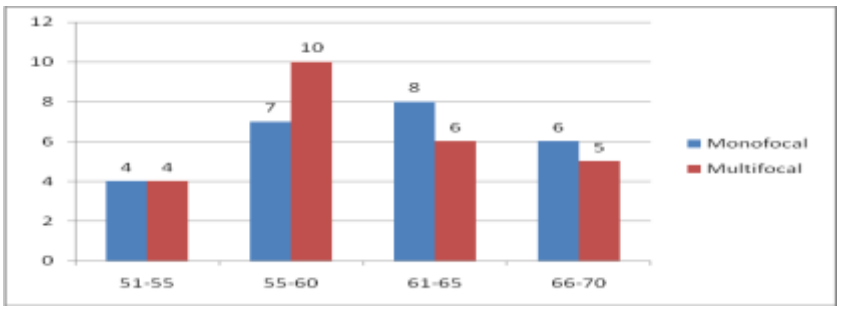
Anaesthesia:
All cases were performed under topical anaesthesia with 4% Xylocaine or Proparacaine 0.5%.

Surgical technique
All surgeries were performed, using a ZEISS 150 microscope by single eye surgeon. In phacoemulsification, cataractous nucleus was removed by a small incision of 2.3 - 3.2 mm, subjected to ultrasonic energy through a needle probe, by which it was broken or emulsified into smaller, softer fragments and then aspirated. Following lens extraction, foldable IOL was placed in the capsule bag.[3,11.]

IV. Results and analysis

Table I: Age Distribution In Yrs

Age distribution	51-55	55-60	61-65	66-70	Total
Monofocal	4(16%)	7(28%)	8(32%)	6(24%0	25
Multifocal	4(16%)	10(40%)	6(24%0	5(20%)	25

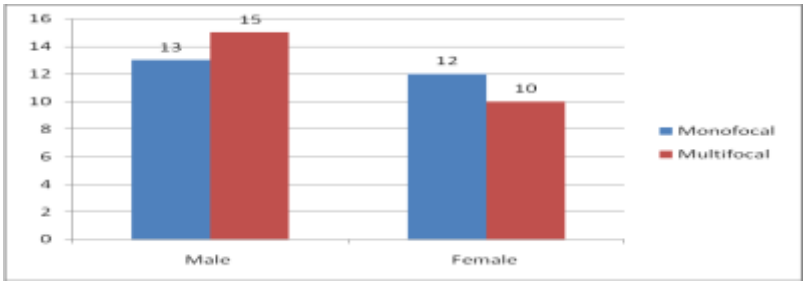


Graph 1: Age Distribution

Majority of the patients in monofocal IOL group belong to 61-65 yrs (32%) whereas 56-60 years (40%) in multifocal IOL group.

Table 2: sex distribution:

Group	Male	Female
Monofocal	13(42)	12(48%)
Multifocal	15(60%)	10(40%)

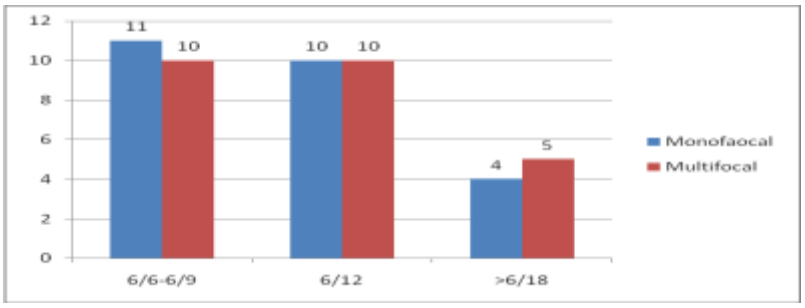


Graph 2: Sex Distribution

In monofocal IOL group 13(52%) were male, 12(48%) were female. In multifocal IOL group 15(60%) were male, 10(40%) were male.

Table 3: UCDVA at 1 Week Postoperatively

S.No	UCDVA	Monofocal		Multifocal	
		No.	%	No.	%
1	>6/9	11	44.0	10	40.0
2	6/12	10	40.0	10	40.0
3	>6/18	4	16.0	5	20.0
Total		25	100.0	25	100.0

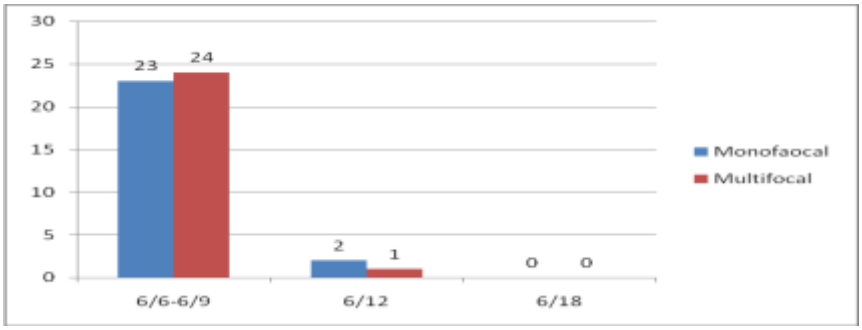


Graph 3: Postoperative UCDVA at 1 Week

UCDVA of > 6/9 at 1 week post-op was in 11 (44%) patients of monofocal group and in 10(40%) of multifocal group.

Table 4: BCDVA at 1 WEEK postoperatively

S.No	BCDVA	Monofocal		Multifocal	
		No.	%	No.	%
1	>6/9	23	92.0	24	96.0
2	6/12	2	8.0	1	4.0
3	>6/18	0	0.0	0	0.0
Total		25	100.0	25	100.0

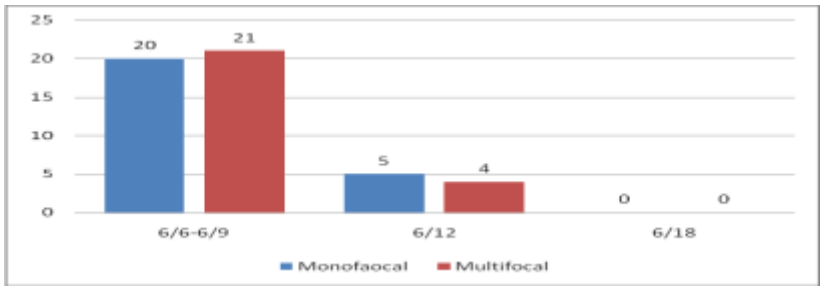


Graph 4: BCDVA at 1 Week

BCDVA of > 6/9 at 1 week post-op was in 23 (92%) patients of monofocal IOL group and in 24(96%) of multifocal group.

Table 5: UCDVA at 6 Weeks Postoperatively

S.No	UCDVA	Monofocal		Multifocal	
		No.	%	No.	%
1	>6/9	20	80.0	21	84.0
2	6/12	5	20.0	4	16.0
3	>6/18	0	0.0	0	0.0
Total		25	100.0	25	100.0



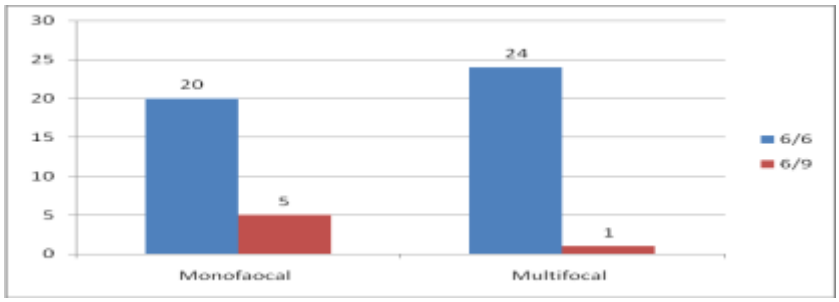
Graph 5: UCDVA at 6 Week

UCDVA of > 6/9 at 6 weeks post operatively was in 20 (80%) patients of monofocal IOL group and in 21 (84%) of multifocal group.

Table 6: BCDVA at 6 Weeks Postoperatively

S.No	BCDVA	Monofocal		Multifocal	
		No.	%	No.	%
1	6/6	20	80.0	24	96.0
2	6/9	5	20.0	1	4.0
Total		25	100.0	25	100.0

BCDVA at the end of 6 week,in monofocal-80%,6/6, in multifocal-96%



Graph 6: BCDVA At 6 Week

Table 7: UCNVA at 1 Week Postoperatively

S.No	UCNVA	Monofocal	Multifocal

		No.		No.	%
1	N6-N10	5	20.0	25	100.0
2	N 12	10	40.0	0	0.0
3	N18	10	40.0	0	0.0
Total		25	100.0	25	100.0

Graph 7: UCNVA At 1 Week

UCNVA of > N6-N10 at 1st week post-op was in 5 (20%) patients of monofocal group and in 25 (100%) patients of multifocal group.

V. Discussion

The most recent estimates from WHO reveal that more than 20 million of global blindness is due to cataract. Worldwide more than 15000 new patients with cataract appear every day. Cataract is the leading cause of avoidable blindness in India and cataract surgery forms the major workload of most ophthalmic units in the country. An estimated 4 million people become blind because of cataract every year which is added to a backlog of 10 million operable cataracts in India, whereas only 5 million cataract surgeries are performed annually in the country.[1,2] Cataract surgery has become one of the safest, most successful and most frequently performed outpatient surgery in the industrialized world. Cataract surgery is one of the most cost effective of all public health interventions in terms of restored quality of life. The available treatment option is surgical extraction of cataract and implantation of IOL to replace the focusing power of the natural lens. IOLs used in cataract surgery are either monofocal or multifocal,[6,7] the former can be used to give clear point of focus for distance or near, but can choose only point of focus. Spectacles provide extra lens power which enables focusing at other points whereas multifocal IOL can correct both distant and near vision which eliminates near vision addition[12].

This study was designed and conducted to compare near and distant vision in two groups of patients receiving multifocal and monofocal IOLs during cataract surgery to supplement our knowledge regarding the role of these two of lenses in the correction of both distant and near vision. All the patients under the study were examined post operatively at day 1 and weekly for 6 weeks.

Distant Visual Acuity

Table 1: Ucdva 1 Week

S.No	UCDVA	Monofocal		Multifocal	
		No.	%	No.	%
1	6/6 - 6/9	11	44.0	10	40.0
2	6/12	10	40.0	10	40.0
3	>6/18	4	16.0	5	20.0
Total		25	100.0	25	100.0

Table 2: UCDVA at 6 Weeks

S.No	UCDVA	Monofocal		Multifocal	
		No.	%	No.	%
1	6/6 - 6/9	20	80.0	21	84.0
2	6/12	5	20.0	4	16.0
3	>6/18	0	0.0	0	0.0
Total		25	100.0	25	100.0

UDVA of > 6/9 was 11(44%) patients (mean 0.18 logMAR) at 1st week and in 20 (80%) patients (mean 0.14 logMAR) at 6 weeks in the monofocal group and in10 (40%) patients (0.15 logMAR) at 1st week and in 21 (84%) patients (mean 0.09 logMAR) at 6 weeks in the multifocal group.

Table 3: BCDVA 1 WEEK

S.No	BCDVA	Monofocal		Multifocal	
		No.	%	No.	%
1	6/6-6-9	23	92.0	24	96.0
2	6/12	2	8.0	1	4.0

3	>6/18	0	0.0	0	0.0
Total		25	100.0	25	100.0

Table 4: Bcdva 6 Weeks

S.No	BCDVA	Monofocal		Multifocal	
		No.	%	No.	%
1	6/6	20	80.0	24	96.0
2	6/9	5	20.0	1	4.0
Total		25	100.0	25	100.0

BCDVA of > 6/9 was 23(92.0%) patients (mean 0.12 logMAR) at 1st week and in 20 (80%) patients (mean 0.14 logMAR) at 6 weeks in the monofocal group and in 24(96.0%) patients (logMAR) at 1st week and in 24 (96.0%) patients (mean logMAR) at 6 weeks in the multifocal group.

There were no significant differences in both the groups of our study with p>0.01 during follow period which was the same in Hashemi study et al, with the mean UDVA and BDVA of 0.14 and 0.05 logMAR respectively in monofocal group, and 0.11 and 0.04 logMAR respectively in multifocal group.

The study of Chiam et al of 80 patients with 40 in each group found that the decimal equivalent UDVA at 2 months was 0.79 and 0.85 respectively.[14]

Ortiz et al compared the visual performance of these two types of IOLs and reported UDVA of 6/9 in both groups indicating no significant differences. [8,9,10]

Cillino et al, compared refractive and diffractive IOLs in cataract patients showing no significant difference in terms of UDVA. Multifocal IOLs are capable of correcting DVA just as monofocal IOLs.[15]

Study by Chiam et al, found no significant differences between the monofocal and the multifocal groups in terms of percentage of cases achieving 20/20 CDVA (82% and 86% respectively)[13,14].

In our study CDVA was not significantly different between the two groups. 23(92%) and 24(93%) patients had more than 6/9 (mean 0.03 logMAR) in both groups respectively.

Near Vision Acuity

Table 5

S.No	UCNVA	Monofocal		Multifocal	
		No.		No.	%
1	N6-N10	5	20.0	25	100.0
2	N 12	10	40.0	0	0.0
3	N18	10	40.0	0	0.0
Total		25	100.0	25	100.0

15(60%) patients had UCNVA > N12 (mean 0.2 logMAR) at first week post operatively in the monofocal IOL group.

25(100%) patients had UCNVA > N12 (mean 0.01 logMAR) at the end of first week post operatively in the multifocal group, which was statistically significant with a p value of 0.001.

The study of Hashemi et al, showed that at 3 months after surgery the UCNV OF Monofocal and multifocal groups were 0.22 and 0.14 respectively, after correction of DVA and the inter group difference was statistically significant.

Findings in other studies support our results and agree that multifocal IOLs improve UCNVA.

The study of Ortiz et al, reported a mean UCNVA of 0.7 and 0.9 decimal in their monofocal and multifocal groups respectively with statistically significant in multifocal group. The study of Cillino et al, stated that these figures were 0.61 and 0.7 decimal respectively and the difference was statistically significant with a conclusion that multifocal IOLs are better capable of correcting NVA.

In the study of by Chiam et al, these figures were 0.34 and 0.7 decimal respectively and the evidence on NVA was in favour of multifocal IOLs. [14]

In our study CNVA was similar in both and monofocal and multifocal IOL group, other similar studies have demonstrated that there are no significant differences between these groups.

VI. Conclusions

There was no significant difference in uncorrected distant visual acuity post operatively in both the groups. However there was a significant difference in the uncorrected near visual acuity. There was no difference in the corrected near visual acuity in both the groups. Multifocal IOLs are a viable alternative for monofocal IOLs in cataract surgeries provided patients selection is done meticulously.

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