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SUBJECTIVE SATISFACTION AND EVALUATION OF GLARE AND HALOS AFTER MULTIFOCAL IOL IMPLANTATION

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ABSTRACT:AIM: To assess the subjective satisfaction and evaluation of glare and halos after multifocal IOL implantation in rural population. **SETTINGS AND DESIGN:** Retrospective study. **MATERIALS AND METHODS:** Two hundred patients with cataract were selected randomly. After written informed consent all patients were subjected for detailed preoperative evaluation. Patients were divided into two groups of 100 each to undergo phacoemulsification followed by either multifocal / monofocal IOL implantation. The monofocal group was taken as control. Both the groups were evaluated post operatively after 1 month for subjective satisfaction by standard questionnaire method and subjective symptoms like glare and halos were evaluated. **STATISTICAL ANALYSIS:** The data was analyzed by chi-square test with $p < 0.05\%$ indicating statistical significance. **RESULTS:** In the multifocal group 90% had good to excellent subjective satisfaction compared to 78% in monofocal group. In the multifocal group 28% had glare and halos compared to 8% in monofocal group. **CONCLUSION:** Multifocal IOLs provide higher subjective satisfaction which overshadowed the minor side effects like glare and halos seen in our patients. **KEY WORDS:** Monofocal IOLs, Multifocal IOLs, Subjective satisfaction, glare and halos.

INTRODUCTION: Cataract extraction with IOL implantation is the most effective, safest and most accepted modality of treatment for cataracts. Cataract surgery has evolved through many phases and now more emphasis is given to the nature of the IOL being inserted. However the problem of loss of accommodation and compromised intermediate and near vision after surgery was the bane of the monofocal IOL. For the postoperative cataract surgery patients with monofocal IOLs constant dependence on spectacles for near work represents frustration. Meanwhile the emergence of multifocal IOL has created new hope for the patients. Patient satisfaction can be enhanced by selecting the right patient through rigid enforcement of the patient selection criteria, by proper counseling of the patient and repeated confirmation of IOL biometry and power calculation.

Criteria for selection of patients for Multifocal IOL: Not every patient can be pleased by any single technique. Patient's satisfaction after a surgical procedure can be enhanced by:-

1. Selection of the right patient
2. Proper patient counseling
3. Careful calculation of IOL power

1. SELECTION OF THE RIGHT PATIENT: This can be done by considering some exclusion criteria.

A. PHYSICAL FACTORS:

- i. Ocular pathology - Patient should be free from any pathology that could affect the visual outcome e.g. poor macular function.

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ii. High Astigmatism – More than 1.5 D of astigmatism may reduce near visual function and may be avoided.

iii. High ametropia – abnormally long or short eyes give inaccurate IOL power calculation.

iv. Small pupils – Those with pupils smaller than 2.5 mm are not good candidates because the central 1.5 mm of the lens is distant dominant.

B. PSYCHOLOGICAL FACTORS: Patients with flexible easy going personality are better candidates.

C. OCCUPATIONAL FACTORS: Multifocal IOLs are not advisable for professional drivers or those who frequently drive at night.

2. COUNSELING OF PATIENTS: The surgeon must personally counsel the patients and not leave this task to their clinical or counseling staff. The patient should be thoroughly counseled that he will not be totally independent of spectacles but most of the time he can achieve good vision for distance and over a range of intermediate and near distances. For long periods of reading or fine work, glasses will be more comfortable.

3. CAREFUL CALCULATION OF IOL POWER: A very careful calculation of IOL power is mandatory and the surgeon should be personally involved in the biometry and keratometry. Establish a personalized SURGEON CONSTANT. It is better to err on the side of very low hyperopia-preferably 0.1 to 0.5 D. This may vary depending on the visual requirements of patients. Better results occur with the multifocal IOL when the patient has binocular vision with good stereopsis. Also, 2 multifocals are better than one.

However contrasting reports were produced regarding the efficacy of multifocal IOL, its side effects and patient comfort. Hence we have done this study to compare multifocal IOL versus monofocal IOL with respect to visual effects such as glare and halos and subjective satisfaction.

AIMS AND OBJECTIVES:

- 1.To study undesired visual effects such as glare and halos.
- 2.To assess subjective satisfaction using a standard questionnaire.

MATERIALS AND METHODS:

SOURCE OF DATA: This retrospective and omized study was conducted on 200 patients who under went cataract surgery between Jan2011toDec 2012 at the Department of Ophthalmology at R.L. Jalappahospital and research centre, Sri Devaraj URS Medical College, Kolar, Karnataka.

INCLUSION CRITERIA:

1. Senile cataract patients without associated ocular pathology.
- 2.Preoperative cylindrical correction of less than 1.25D.

EXCLUSION CRITERIA:

- 1.Irregular astigmatism.
- 2.Axial length more than 26mm.
- 3.Pupil size smaller than 2.5mm for multifocal IOL.

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4.Multifocal group-Patients who have undergone cataract surgery in the other eye with monofocal IOL.

METHOD OF COLLECTION OF DATA: Two hundred patients, fulfilling the inclusion criteria framed from the Department of ophthalmology, R.L.J. HOSPITAL AND RESEARCH CENTRE, TAMAKA, KOLAR were included in the study. All the patients underwent the following pre-operative evaluation and complete eye examination including a full history of any previous ocular disease or surgery, examination by both direct and indirect ophthalmoscopy, visual acuity recording by Snellen's chart, Applanation tonometry, Keratometry, A scan with intraocular lens power calculation by SRK-2 formula and detailed slit lamp examination. General physical and systemic examination including cardiovascular system and respiratory system examination, blood pressure recording and blood sugar estimation were done. All patients were put on oral Tab Ciprofloxacin 500mg twice daily, Tab Acetazolamide 250mg twice daily and Ciprofloxacin 0.3% eye drops hourly one day prior to surgery. Preoperatively pupils were dilated with Tropicamide with Phenylephrine 0.5% or 1% drops along with Flurbiprofen 0.03% drops. Informed consent was taken from all patients. Sensitivity to local anaesthetics was tested with lignocaine test dose. Ethical clearance obtained.

The patients were randomly divided into two groups:

- Group A: Phacoemulsification with multifocal IOL implantation-100 patients
- Group B: Phacoemulsification with monofocal IOL implantation-100 patients

All surgeries were done by a single operating surgeon. In both the groups 2.8mm triplanar clear corneal incision was made in superior temporal quadrant 1mm anterior to anatomical limbus followed by phacoemulsification. The procedure was followed by implantation of multifocal/monofocal intraocular lens.

Postoperatively patients were put on topical steroids and antibiotics for 4 to 6 weeks with gradual tapering. Tablet ciprofloxacin 500mg were given for 5 days.

Following phacoemulsification with multifocal/monofocal IOL, patients were evaluated postoperatively for subjective satisfaction and glare and halo after 1 month.

Glare and Halos were assessed by the following questions: Rings around light were scored between 0-4.

- No limitation-0
 - Little bit-1
 - Moderately-2
 - Quite a bit-3
 - Extremely troublesome-4
- Present: 2-4
Absent: 0-1

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Subjective satisfaction of the patient was assessed by asking following questions:

QUESTIONNAIRE:

- Do you experience any difficulty in far vision (blurred/distorted)?
- Do you experience any difficulty in near vision (blurred/distorted)?
- Do you experience any difficulty in night vision?
- Do you experience any difficulty in colour vision?
- Rating of distance vision overall:
- Rating of near vision overall:

No difficulty-1

Moderate difficulty-2

Severe difficulty-3

The data was analysed by chi-square test with $p < 0.05$ indicating statistical significance.

RESULTS: In this study 100 patients each were enrolled in both the multifocal and monofocal IOL groups and were evaluated and compared for visual effects such as glare and halo and the overall subjective satisfaction.

The patients were comparable in age and sex in both the groups (Tables 1 and 2):

AGE AND SEX DISTRIBUTION:

Age distribution	Multifocal	Monofocal
50-60	44	40
61-70	40	36
71-80	16	24

TABLE:1

Sex distribution	Multifocal group A	Monofocal group B
Male	60	52
Female	40	48

TABLE: 2

Visual side effects such as glare and halos were assessed and the response was recorded.

GLARE AND HALOS AFTER 1 MONTH				
Glare and halos	MULTIFOCAL(GROUP A)		MONOFOCAL(GROUP B)	
	No.of patients	Percentage	No.of patients	Percentage
Present	28	28	08	8
Absent	72	72	92	92

TABLE: 3

In the multifocal group 28% had glare and halos compared to 8% in monofocal group.
p value: 0.009, statistically significant.

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Subjective satisfaction was assessed in both the groups by standard questionnaire (TABLE 4 and 5)

SUBJECTIVE SATISFACTION	None	Moderate	Severe
Blurred /Distorted far vision	88	10	02
Blurred /Distorted near vision	93	7	00
Night vision	85	10	05
Colour distortion	91	9	00
Rating of distance vision overall	88	12	00
Rating of near vision overall	93	7	00

TABLE 4: SUBJECTIVE SATISFACTION IN MULTIFOCAL GROUP

SUBJECTIVE SATISFACTION	None	Moderate	Severe
Blurred /Distorted far vision	89	08	03
Blurred /Distorted near vision	67	31	02
Night vision	77	20	03
Colour distortion	77	18	05
Rating of distance vision overall	88	07	05
Rating of near vision overall	68	27	05

TABLE 5: SUBJECTIVE SATISFACTION IN MONOFOCAL GROUP

In the multifocal group 90% had good to excellent subjective satisfaction compared to 78% in monofocal group.

DISCUSSION: The visual performance of patients after cataract surgery depended largely on the type of intraocular lens (IOL) implanted. Monofocal IOLs have a single, fixed focal length unable to provide full-time spectacle independence. Multifocal IOLs, where multiple focal lengths are present within the optical zone, have been designed to provide unaided distance and near vision. Multifocal IOLs are either refractive or diffractive. With multifocal refractive zones two images (far and near) are produced simultaneously and the human brain is able to adapt to near and far vision, depending on what it is looking at. These lenses, however, are associated with significant reduction in contrast sensitivity and night vision problems (photoc phenomenon). These drawbacks were partially overcome by changing optical design of the IOL, and with the aid of the pupil to direct different amounts of the refracted light on the different foci, thus favoring distance or near vision.

Monovision principle was adopted to improve reading ability with monofocal lenses, it may be helpful, but binocularity is sacrificed. Accommodating IOLs depend upon modification of the optic-haptic junction or dual optic technology to allow movement, or change in the position or the shape of the optic in response to an accommodative effort. Multifocal IOLs are designed to distribute energy between distance and near foci on the retina, but the first generation of these lenses were associated with high rate of glare and halos.

Many quality-of-life studies used validated questionnaires to assess functional visual outcome and patients' satisfaction after cataract surgery with multifocal and monofocal IOLs. In our study we assessed visual function in patients with multifocal IOLs are using simple forms of

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questionnaire mainly to address near visual activities and patient satisfaction with the outcomes. Almost 90% of patients were satisfied with their visual outcome in multifocal IOL group compared to 78% in monofocal IOL group, 83% had no troubles with their vision, and 70% noted an improvement of their quality of life.

In a study done by Tarek M et al postoperative distant acuity was 20/40 or better in 92.6% of eyes and near acuity was J3 or better in 88.9%. Five patients had transient visual symptoms; one had persistent halos around light. The overall VF-14 score was 83.9. The average score for items testing "near" visual tasks was 82.6 compared to a score of 85.8 for "intermediate" and 86.4 for "distance" visual tasks. Some patients were less satisfied with intermediate activity, especially in computer work. Most patients having cataract surgery with Re STOR multifocal lenses were generally satisfied with their visual function for both distance and near, but not so with intermediate vision like computer work¹.

However on the patient satisfaction questionnaire in a study done by Rossetti and colleagues reported that 60% of all diffractive IOL and monofocal control groups had discomfort when using spectacles for near vision².

In a study done by Steinert RF et al a significantly higher proportion (81%) of bilateral zonal-progressive multifocal subjects reported that they could function comfortably at near without use of spectacles relative to 56% multifocal/monofocal subjects and 58% unilateral multifocal subjects³.

In a study done by Cillino S et al concluded that Multifocal IOLs provide a greater depth of focus and higher patient satisfaction, and make intermediate and near visual tasks easier than do monofocal lenses. New-generation, diffractive, pupil independent multifocal IOLs provide better near vision, equivalent intermediate vision, less unwanted photic phenomenon, and greater spectacle independence than either monofocal or refractive multifocal IOLs⁴.

The perception of glare and halos has been reported in subjects implanted with multifocal IOLs. The degree to which glare and halos are perceived appears to be somewhat dependent on the type of multifocal lens implanted. In our study we reported in the multifocal group 28% had glare and halos compared to 8% in monofocal group.

Gimbel et al reported significantly more visual side effects (e.g. halos, flare, glare, blurred vision and rings) in subjects bilaterally implanted with 3M diffractive lens compared to the bilateral monofocal control subjects⁵.

In a study done by Rosetti et al showed that 60% of all patients reported discomfort when using spectacles for near vision in monofocal group. Patients in the multifocal group were more satisfied with their near vision than those in the monofocal group. The difference in satisfaction was not significantly different although more multifocal patients reported visual phenomena (e.g., glare, halos)².

In a study done by Javitt J, Steinert R showed that patients who had received multifocal IOLs on average reported having between "a little bit" and "some" glare or halo, whereas patients who had received monofocal IOLs reported between "none" and "a little bit" of glare or halo (1.57 vs. 0.43; $P < 0.001$)³.

In a study done by Sen HN et al showed that both distance and near visual acuities were significantly better in the multifocal group than in the monofocal group; the difference was most prominent in distance corrected near acuity ($P < .001$). Thirty-five eyes (67.3%) in the multifocal group and ten eyes (14.9%) in the monofocal group achieved a distance corrected near acuity of J6

THE HISTORY OF THE UNITED STATES

The history of the United States is a story of growth and change. From the first settlers to the present day, the nation has evolved through various stages of development. The early years were marked by exploration and settlement, followed by a period of rapid expansion and industrialization. The American Revolution and the Civil War were pivotal moments in the nation's history, shaping its identity and values.

The American Revolution was a turning point in the nation's history. It was a struggle for independence from British rule, fought between 1775 and 1781. The revolution was led by George Washington and resulted in the signing of the Declaration of Independence in 1776. The new nation was born, and the path was set for a future of freedom and democracy. The Civil War, fought between 1861 and 1865, was another pivotal moment in the nation's history. It was a struggle for the preservation of the Union and the abolition of slavery. The war was fought between the North and the South, and it resulted in the Union's victory and the end of slavery.

The American Civil War was a conflict that shaped the nation's future. It was a struggle for the preservation of the Union and the abolition of slavery. The war was fought between the North and the South, and it resulted in the Union's victory and the end of slavery. The war was a turning point in the nation's history, as it led to the passage of the 13th and 14th Amendments to the Constitution. The 13th Amendment abolished slavery, and the 14th Amendment granted citizenship to all persons born or naturalized in the United States, including African Americans.

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(20/40) or better; 30 eyes (56.6%) and 19 eyes (28.4%), respectively, achieved a best corrected distance acuity of 20/20 or better. Glare symptoms decreased postoperatively in both groups but were slightly more common in the multifocal group. In contrast, halos were significantly more common at 1 month in the multifocal group ($P<.001$). The change in the quality of life postoperatively, measured with the VF-7(7 item visual function test), was significant and identical in both groups⁶.

Kamlesh et al reported 60% of glare and halos in multifocal group as compared to 35% in monofocal group⁷.

Studies of Allen et al also expressed a higher percentage of satisfied patients in the multifocal group as compared to monofocal group of patients. In spite of troublesome effects of glare and halos the overall subjective satisfaction was 92%⁸.

The high satisfaction scores for the multifocal subjects showed that increase in perception of halos and glare is usually acceptable to the subjects.

CONCLUSIONS: Multifocal IOLs provide higher subjective satisfaction which overshadowed the minor side effects like glare and halos seen in our patients. Careful patient selection is the determining factor to achieve better proper functional visual outcome and patient satisfaction.

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