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RESEARCH ARTICLE

CORRELATION OF PREOPERATIVE IOL POWER WITH THE POSTOPERATIVE REFRACTIVE STATUS IN SENILE CATARACT.

Dr. Kanhei Charan Tudu¹ and Dr. Loknath Mohanty².

1. Associate Professor, Dept of Ophthalmology, VSS Institute Of Medical Science & Research, Burla
2. MS Ophthalmology, VSS Institute Of Medical Science & Research, Burla.

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Keywords:-

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Abstract

Aim of study-To correlate preoperative IOL power and postoperative refractive status in patients operated for senile cataract admitted to department of Ophthalmology in a tertiary health care centre

Material And Methods: This is a hospital based prospective observational study was done for 2 year in 110 patients. All cases of senile cataract without systemic /other ocular diseases admitted for cataract surgery are included in this study. Traumatic cataract and complicated cataract, Senile cataract with systemic or associated complications, All cases congenital and developmental cataract, Cases with intra or postoperative complications, Cases of axial length <21mm or >25mm were excluded from the study.

In all the patients IOL power calculated using A scan and biometry (SRK-II) and cataract extraction done by manual SICS with PMMA IOL implantation by a single surgeon. Refractive status evaluated at 6 weeks postoperatively in all patients.

Results: From our study it is concluded that Post-operative myopic (66%) is more common than hypermetropic shift (31%), with Most of the postoperative error is within $\pm 1.5D$. Visual acuity varied from 6/6 - 28.6%, 6/9-41.6%, 6/12-20%, 6/18-10% at 6 weeks postoperatively Refractive error varied between $\pm 1.5D$ Spherical with $\pm 1.5D$ Cylindrical with or without the rule Cylindrical error was common postoperatively.

Conclusion: In spite of exclusion of associated systemic and ocular diseases, Proper preoperative evaluation of IOL power is necessary and important tool for better post-operative refractive status.

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Introduction:-

Cataract is the most common and fortunately one of the most easily remediable causes of visual incapacity of blindness. Apart from its occurrence as a developmental anomaly and in various diseases, senile cataract may be looked upon as a normal evidence of senescence occurring in 65% of people in the sixth decade and in over 95% above 65 year of age. As per WHO criteria for definition of blindness, approximately 45 million people in the world are estimated to be blind. Another 135 million people are deemed to be visually disabled. One of the major causes of blindness based on WHO reports with cataract accounting 43%¹. Ophthalmic surgeons have witnessed a tremendous evolution of cataract surgery in 20th century. The most remarkable advance is decrease in the size of incision from

Corresponding Author:-Kanhei Charan Tudu.

Address:-Associate Professor, Dept of Ophthalmology, VSS Institute Of Medical Science & Research, Burla.

9mm in ICCE to 0.9 mm in phacoemulsification. Though the history of IOL implantation goes back to 18th century, the successful modern practice of IOL implant surgery started when Sir Harold Ridley inserted the first IOL (PCIOL) in the left eye of a 45 year old lady after ECCE at St Thomas Hospital, London, on 29th November 1949². With advent of IOL implants functional vision is readily available without depending on spectacles or contact lens and preoperative measurement of IOL power is the most essential for best visual acuity. The era of IOL power calculation began because Ridley's first patient had a post-operative refraction error of -18D sph, + 6D cyl 30⁰. From this dissatisfaction, the mini science of "BIOMETRY" has risen. It is now established as a routine procedure prior to modern cataract surgery. Basically it consist of keratometry reading through a keratometer, an ultrasonic measurement of the axial length of the eye with measurement of anterior chamber depth and a third parameter A constant, which is specific for each lens type and of manufacturer. These four information are fed into various formulae to calculate the IOL power preoperatively. The most popular is the regression formulae is that of sander Retzaff kraff (SRK formulae)³. It is always logical and scientific that on IOL of appropriate if not exact power be implanted so as to make the postoperative refraction emmetropic, but however some error may creep in due to patients, surgeon or even instrumental error. While astigmatism may be purely surgical, spherical error may be due to a miscalculation of power and implantation of IOL.

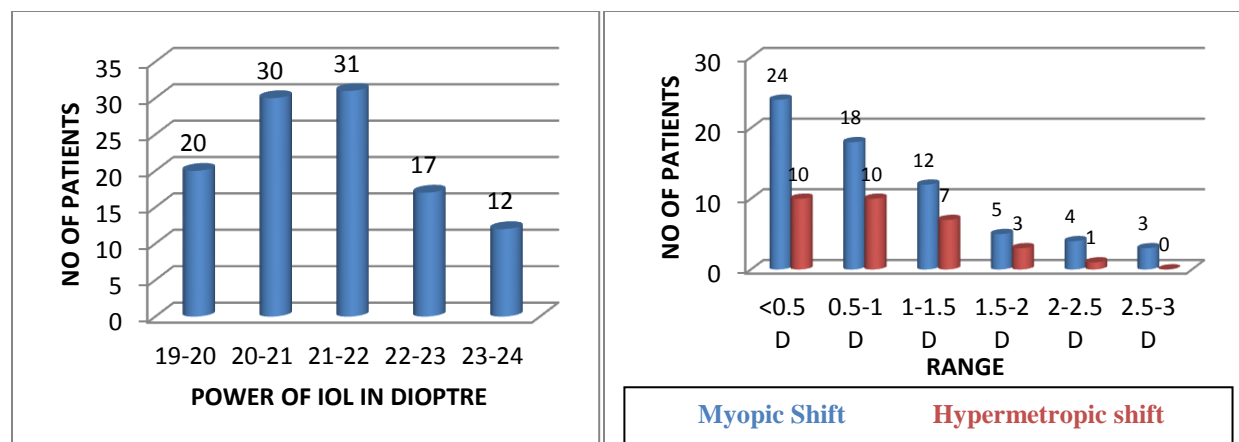
The present study aims at correlation between preoperative measurement of IOL power in senile cataract patients and postoperative evaluation of the refractive status after manual small incision cataract surgery with IOL implantation.

Material and Methods:-

The study was a randomised prospective observational study of 110 patients with senile cataract of various grades carried out in a tertiary health care centre between the periods of Nov 2015 to Sept 2017. The cases for the study were selected from the indoor patients admitted for cataract surgery. Inclusion Criteria were all the cases of senile cataract without systemic /other ocular disease. The exclusion Criteria were traumatic cataract and complicated cataract, Senile cataract with systemic or associated complications, Cases with post-operative complications, Cases with axial length <21 mm or >25 mm. Pre-operative IOL power measurement was done for every patients. Measurement of radius of Curvature of the Cornea (Keratometer) was done with keratometer Model – BAUSCH & LOMB with Measurement Range – 36 to 52 Dioptre. A scan done to measure the axial length with A-Scan Biometer Model –OPTIKON 2000–BIOMETER V.2 Measurement Range-18-36 mm. PMMA lens with A constant of 118.2 was used as IOL in all patient. In all the patients cataract extraction done by manual SICS with PMMA IOL implantation by a single surgeon. Patients were discharged on 3rd day of operation if everything is within normal limit. At the time of discharge patients were advised to use Prednisolone 1% eye drop starting 6 times a day to be continue in a tapering manner for 6 weeks, with moxifloxacin eye drop 4 times a day for 1 week and cyclopentolate 0.5 % eye drop 2 times a day for 1 week in the operated eye. Patients were advised to come for check-up after 1st week, 2nd week, 4th week and at 6th week refraction test was done to assess refractive status. Further follow up at 3 months was advised to detect any late post-operative complications. In every visit the visual acuity (distant vision) was recorded using Snellen's test type chart or Landolt's broken ring test (for illiterate persons). Retinoscopy of each case was done along with auto refractometry. The refractive error was recorded; Trial of glasses done and final glass correction was given at 6 weeks if needed.

Results:-

Out of 110 patients 67 patients were male, and 43 were female with 59.09% patients in the age group of 56-65 years and 23.63% of patients were in the age group of 46-55 year. 56.36% of patients were from rural population and 43.64% from urban population. Right eyes were operated more than left. In case of bilateral cataract the patient and surgeon prefer right eye for operation than left eye. 54.54% of the patients had nuclear cataract, 39.1% had cortical cataract and 6.36% with sub-capsular cataract. Maximum cases operated for IOL implementation were mature type of cataract (57.27%). Pre-operative visual acuity measured were 6/18-6/36 in 5 (4.54%), 6/36-6/60 in 14 (12.73%), 5/60-4/60 in 44 (40%), 3/60-2/60 in 19 (17.27%), CF 1mt-HM +ve in 15 (13.6%) and PL+ /PR+ in 13 (11.8%). Axial lengths measured were in the range of 21-22mm in 21, 22-23mm in 30, 23-24mm in 40 and 24-25mm in 19 patients respectively. 27.28% of cases were implanted with 20-21D of intraocular lens and 28.19% of cases were implanted with 21-22 D , and 18.18% cases were implanted 19-20 D and 15.45% cases were implanted with 22-23D . Most of the patients were found to have a myopic shift around 60% followed by Hypermetropic shift around 28% only 12% of patients have post-operative Emmetropia for the spherical component.



Post-Operative Refractive Error

Range	Myopic shift	Hypermetropic shift
<0.5 D	24	10
0.5-1 D	18	10
1-1.5 D	12	7
1.5-2 D	5	3
2-2.5 D	4	1
2.5-3 D	3	0
Total	66	31

From Table it was seen that PCIOL implantation after calculating the power of IOL for the particular eye is quite accurate than other method. 57% of cases were Less than ± 1 D post-operative refractive error, 92% of cases had $< \pm 2$ D post-operative error. It was seen that 23.63% of patients attained post-operative 6/6 vision, 54.54% patients had 6/9-6/12 vision, 7.27% patients had 6/18-6/24 vision. 11.83% patients had 6/36-6/60 vision and only 2.73% of cases have acuity of less than 6/60. Amount of the visual loss upto 6/18 due to uncorrected astigmatism and spherical error. ARMD and fundus degeneration are responsible for visual loss of 8% and 13% respectively.

Discussion:-

In this study maximum presentation of the patients for cataract surgery were in the age group of 56-65. This study is corroborating with The Beaver Dam Eye Study (1988-1999) which show the percentage of visually significant cataract after the age of 65 years is around 50%⁴. The study shows maximum patients 56.36% belonged to rural population, 90% belonged to middle class and low socioeconomic group with 59.1% literate and 40.9% illiterate patients. Majority of the patients presented with nuclear cataract 54.5% in the study, that Corroborating with the beaver dam eye study 2005. Patient with mature type of cataract are maximum, which is around 57.27% in the study and majority of the patient operated had visual acuity from 5/60-4/60.

All patients evaluated postoperatively for the refractive status and acceptance of the spherical lens found that 66 patients had myopic refraction, 31 patients had hypermetropic refraction, and only 11% attained post-operative emmetropia. Patients of myopic and hypermetropic shift with acceptance of $< \pm 1$ D is around 55%, acceptance of $< \pm 2$ D found in 79% and acceptance of $< \pm 3$ D found in 100%. The largest spherical error in this study is 3D. The result of this study is corroborating with the study of T Olsen 1998 and reports of JCRS November 2003⁵. In this study there is no significant difference between refractive errors in men and women in pre and post-operative period. This finding corroborate with the study of RJ Olsen, Sc Richards⁶. JP Mc culley shown that 82% of patients had post-operative within ± 2 D and 100% were within ± 3 D of predicted value⁷. MS Dang and PP Raj (1989) showed that SRK II formula was more accurate than other formula. 80% of the patients had less than one dioptr error and one eye (0.3%) had an error of more than 3D⁸. T Olsen L Cordyden concluded that post-operative refractive error can be controlled with reasonable accuracy after doing a preoperative IOL power calculation⁹. A study published in 1998 ophthalmologica reports that SRK II formula used for the normal eyes having axial length between 21-24.5 mm shows post-operative ± 1 D variation in 94.3% cases and ± 2 D variation in 98.8% cases. For myopic eye axial length > 25 mm shows post-operative ± 1 D variation in 58.2% cases and ± 2 D variation in 84.2% cases. A study

published in JRCS in 2003 NOVEMBER, reported that using applanation A scan for axial length measurement showed post-operative variation $\pm 0.5D$ in 61.2% and $\pm 1D$ variation in 77.5%. Using IOL master for axial length measurement $\pm 0.5D$ variation in 77.5%, $\pm 1D$ variation 92.3%. By using immersion A scan $\pm 5D$ variation is seen in 92% cases and $\pm 1D$ variation is seen in 100%⁹. Tony Fernandez et al 1989 in their series of 5000 cases of lens inserted in the capsule bag reported on 84% incidence of visual acuity between 6/6 to 6/18 with correction. American academy of ophthalmology, 2007 reports 90% of the patients having vision $>20/40$ after cataract surgery with PCIOL implantation.¹⁰

From the present work it was observed that preoperative measurement of IOL power had a very important role in decreasing the post-operative refractive error in modern cataract surgery. One should not do an intelligent guess about the power of IOL instead of doing biometry.

Conclusion

From the present work it was observed that preoperative measurement of IOL power had a very important role in decreasing the post-operative refractive error in modern cataract surgery. One should not do an intelligent guess about the power of IOL instead of doing biometry. It is seen that even after implantation of IOL of calculated power some of amount of post-operative error creeps in. It may be due to personal, instrumental or IOL related reasons. The postoperative refractive outcome can be improved after cataract surgery by increasing accuracy of IOL power calculation. Suggestions for the improvement of IOL power calculation are verifying measurements when necessary, Calibration of the instrument regularly, optimizing the lens constants for each IOL, Creating a round, centred capsulorhexis.

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