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ORIGINAL ARTICLE

COMPARISON OF ANTERIOR CHAMBER REACTION WITH SINGLE-PIECE AND THREE-PIECE INTRAOCULAR LENSES IN MANUAL SMALL INCISION CATARACT SURGERY

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ABSTRACT: OBJECTIVES: To study the anterior chamber reaction between single-piece and three-piece intraocular lenses in manual small incision cataract surgery. **METHODS:** Prospective study done at Mysore Race Club Charitable Eye Hospital. 140 Patients underwent suture less sclerocorneal tunnel cataract surgeries with single-piece or three-piece Polymethylmethacrylate (PMMA) intra ocular lenses (3-piece IOL). Accurate Keratometry was done with the help of Bausch and Lomb Keratometer. IOL power was calculated by using SRK (Sanders-Retzlaff-Kraff) II formula, with the help of non-immersion, contact type of A-Scan biometry. Single-piece IOLs were inserted in 70 patients. Three-piece IOL inserted in rest of 70 patients. Slit lamp examination for anterior chamber cells was graded according to Hogan system. Aqueous cells were measured by counting within the visible field under Slit lamp, keeping the beam at maximum intensity. Anterior chamber reaction (AC) in 1stPostoperative week and at 8 weeks are compared and analyzed by ANOVA statistics. **RESULTS:** Single piece IOL group had anterior chamber reaction ranging from 1 to 2+ cells i.e., in 97%. In three-piece IOL group, 70%of eyes had 2+ cells and 12.8% had 3± cells. At 8 weeks, single- piece IOL showed either no cells or occasional cells in 98.6% of patients, compared to three –piece IOL group showing in 77%of cases. 23% had 1+ cells in later group. **CONCLUSION:** Single-piece implanted IOLs had significant less number of cells were seen in anterior chamber from 1 week to 8 weeks as compared to three-piece IOLs.

KEYWORDS: Intraocular lenses, cataract.

INTRODUCTION: Manual Small Incision Cataract Surgery (MSICS) gained popularity and it is practiced by many surgeons in the developing countries. It has many advantages like, surgery can be done within a short duration time without compromising quality and visual outcome, faster return to normal activities, reduces the chances of surgically induced astigmatism or snapped sutures, ability to stop surgery at any point in the procedure; it causes less discomfort to the patient after surgery because, it is suture less. MSICS technique is vastly adapted in community-service-oriented and charitable institutions to make their poor and under privileged patients reap the benefit of a successful surgical procedure with minimal astigmatism.

MATERIAL AND METHODS: This is a prospective study done at Mysore Race Club Charitable Eye Hospital from June 2008 to July 2009. 168 eyes of 168 patients underwent suture less sclerocorneal tunnel cataract surgeries with polymethyl methacrylate intraocular lenses. 140 patients out of 168 qualified for this study due to lack of follow up. A single surgeon performed all these surgeries.

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EXCLUSION CRITERIA: Complicated cataract, traumatic cataract, corneal opacities, corneal degenerations, uveitis, pseudo exfoliation, glaucoma, connective tissue disorders, and previous ocular surgeries, pathological conditions of the optic nerve and retina, external eye diseases, uncontrolled diabetes, uncontrolled hypertension.

INCLUSION CRITERIA: Senile/ pre senile cataract, including mature and immature cataract, well dilated pupil. Informed consent obtained in every case, with age group ranging from 40 years to70 years. Preoperative visual acuity assessed in all 140 patients, nasolacrimal duct patency noted, intraocular pressure estimated with Goldmann Applanation Tonometer. Blood pressure recorded, urine sugar strip test was done. Fundus examination was done with indirect ophthalmoscope by using 20D lens and 90D lenses wherever possible. Using Bausch Lomb Keratometer and non-immersion contact type A-scan Biometry IOL power was calculated by using SRK II formula.

Preoperatively, ciprofloxacin eye drops instilled hourly into conjunctival sac, 24 hours prior to surgery. Flurbiprofen 0.3% eye drops, tropicamide 0.8%, and phenylephrine 5% eye drops started 2 hours before surgery at an interval of 15 minutes. Proper aseptic precautions were taken and 7mm conjunctival peritomy done. A frown incision of 6mm was made on superior aspect of sclera with No.11 Bard parker blade, the summit of which was 1.5mm away from the limbus. Sclerocorneal tunnel was made with a 2.6mm crescent blade, extended 1.0mm anteriorly into the cornea. Paracentesis was done anterior chamber was maintained with 2% hydroxypropyl methylcellulose (HPMC).

A 6 to 6.5mm continuous curvilinear capsulorhexis (CCC) was done with cystitome. Anterior chamber was entered with the help of a keratome. A good cortical cleaving hydrodissection was done in relevant cases. Nucleus was prolapsed into anterior chamber with a lens dialler/sinskey hook. Irrigating vectis was used to deliver the nucleus. Thorough cortical wash was done in all cases with a two-way 22 guage Simcoe cannula and bulb. A three- piece IOL/single- piece polymethyl methacrylate IOL of 6mm optic size was placed inside the bag depending upon randomly assorted cases with 70 in each group. Viscoelastic substance was thoroughly washed and the anterior chamber was formed by ringer lactate solution.

The wound integrity was checked after releasing superior rectus bridle suture. A subconjunctival injection of 0.5ml of gentamycin and 0.5ml of dexamethasone was given at the end of surgery. Postoperatively, a combination of chloramphenicol 0.5% and dexamethasone 0.1% eye drops were given 8times/day. cyclopentolate 1% eye drops thrice a day were advised and was slowly tapered depending upon observation over a period of 8 to 10 weeks. Slit lamp examination of anterior chamber cells were graded according to Hogan system[1] at 1stpostoperative (postop) day, 1 postop week and 8th postop weeks. Aqueous cells were measured by counting within the visible field under slit lamp, keeping the beam at maximum intensity.

Grade	Cells per field in a 2mm height, 1mm width light beam of slit lamp
0	0
1+	5-10
2+	10-20
3+	20-50
4+	> 50

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RESULTS: Age distribution of patients with respect to single-piece and three-piece IOLs are shown below.

Age in years	Single piece IOL		3 Piece IOL		Total
	No of patients	Percentage	No of patients	Percentage	
40-49	2	2%	3	4	5 (3.57%)
50-59	21	30%	22	31.42	43 (30.71%)
60-69	31	44.2%	28	40	59 (42.14%)
>70	16	22.8%	17	24.28	33 (23.57%)
Total	**70**	**100%**	**70**	**100%**	**140 (100%)**

Patients more than 60 years of age of which 67% had single-piece IOL insertion and 65% had 3-piece IOL insertion.

NUCLEAR GRADING:

Nuclear grading	Single piece IOL		3 Piece IOL		Total
	No of patients	Percent	No of patients	Percent	
N_2	7	10%	5	7.1%	12 (8.57%)
N_3	36	51.4%	39	55.7%	75 (53.5%)
N_4	24	34.2%	21	30%	45 (32.1%)
SMC	3	4.2%	5	7.1%	8 (5.7%)
Total	**70**	**100%**	**70**	**100%**	**140 (100%)**

Intraoperative complications were nil in this study.

SLITLAMP EXAMINATION AT 1 WEEK: Single piece IOL had AC reaction ranging from 1 to2+ cells i.e., in 97%. In three-piece IOL group, 70% of eyes had 2+ cells and 12.8% had 3+ cells in anterior chamber. One case in three-piece IOL group had 4+ cells, though the surgery in this case was uncomplicated, mostly because of noncompliance; after rigorous treatment with topical and systemic steroids, she ultimately had best corrected visual acuity of 6/6 at the end of 8 weeks follow up.
The AC reaction in 1st Postoperative week in Single-piece and 3-piece IOL.

AC Reaction	Single piece IOL		Three piece IOL	
	No	%	No	%
0	-	-	-	-
0.5+	-	-	-	-
1+	35	50	11	15.8
2+	33	47.1	49	70
3+	2	2.9	9	12.8
4+	-	-	1	1.4
Total	**70**	**100**	**70**	**100**

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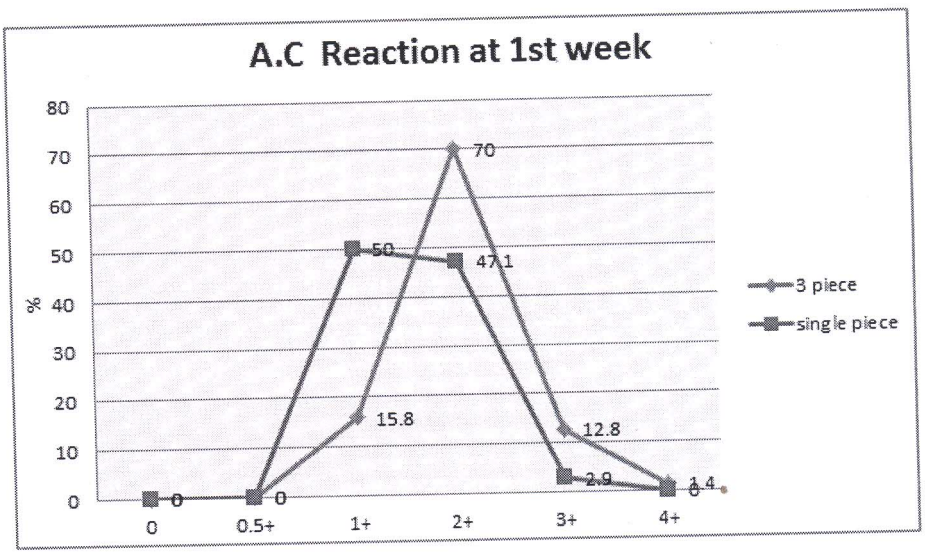
At the end of 8 weeks showed, in the eyes where single-piece IOL was implanted there were either no cells or occasional cells in 69 out of 70 eyes(98.6%);whereas in three-piece IOL group 54 out 70(77%)had either no cells or occasional cells. The remaining 16 eyes (23%) had 1 + cells, they did not complain of pain or redness or blurred vision. Statistical analysis shows that, anterior chamber cells significantly decreased from 1week to 8 weeks follow up in both the groups with value significance ($p<0.05$).In single piece implanted IOLs statistically significant less number of cells were seen in anterior chamber from 1week to 8weeks as compared to three-piece IOLs with significance(sig) 0.006 i.e., $p<0.05$.



A C reaction at 8th postoperative week.

AC Cells	Single- piece IOL		Three- piece IOL	
	No %		No %	
0	31	44.3	18	25.7
0.5+	38	54.3	36	51.42
1+	1	1.4	16	22.9
2+	-	-	-	-
3+	-	-	-	-
4+	-	-	-	-
Total	**70**	**100**	**70**	**100**

AC reaction in three-piece and single–piece IOL at 8 weeks.

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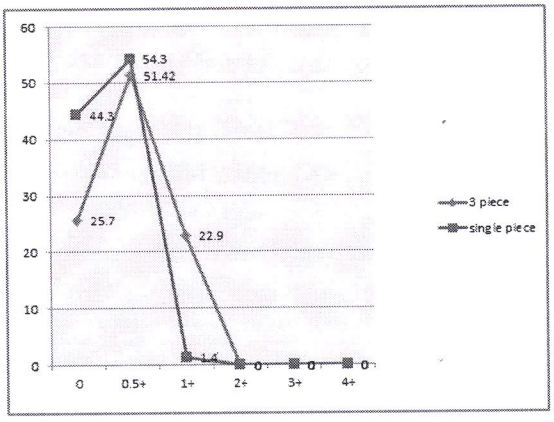

Repeated measure ANOVA test was done to analyze these findings.

Source	Type III sum of squares	df	Mean squares	F	Significance (P-Value)
1 week to 8 weeks	130.972	1	130.972	751.693	0.000
Single piece IOL reaction to 3-piece IOL reaction	1.358	1	1.358	7.794	0.006

F=Fischer value df=Degree of freedom P=Probability

DESCRIPTIVE STATISTICS:

Duration	Lens	Mean value of AC cells	Standard deviation	Number of eyes
1 week	Single-piece	1.5143	0.5580	70
	3-piece	2.0000	0.5898	70
	Total	1.7571	0.6218	140
8 weeks	Single-piece	0.2857	0.2634	70
	3-piece	0.4929	0.3457	70
	Total	**0.3893**	**0.3234**	**140**

UCVA	Three –piece IOL				Single-piece IOL			
	Preoperative		Postoperative		Preoperative		Postoperative	
	No	%	No	%	No	%	No	%
<6/60	42	60	0	-	37	52.9	0	-
6/60-6/18	28	40	6	8.6	33	47.1	4	5.7
6/18-6/12	-	-	17	24.3	-	-	14	20
6/9-6/6	-	-	47	67.1	-	-	52	74.3
Total	**70**	**100**	**70**	**100**	**70**	**100**	**70**	**100**

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UCVA (Uncorrected visual acuity) in three piece IOL and Single piece IOL groups at 8th postoperative weeks.

91% in three-piece IOL group and 94% in single-piece IOL group had UCVA of >6/18.

POSTOPERATIVE COMPLICATIONS: Posterior capsular opacification developed in three-piece IOL case at 8 weeks. Cystoid macular edema developed in two cases, one in three-piece IOL group and another in single-IOL case at 8 weeks. There were no major complications like posterior capsular tear, wound leak, secondary glaucoma, retinal detachment or endophthalmitis.

DISCUSSION: Jaffe[2], Roger steinert[3]: Found that postoperative uveitis may occur in cases with PMMA IOLs especially with prolene/ polypropylene loops (3-piece IOLs) due to;

- Initial activation of high level of complements which leads to generation of biologically active C_5 derived peptides.
- C_5 derived peptide induces increased vascular hypermeability, anaphylatoxin activity, limbal flux, uveal leakages which perpetuates leakage of complement components and IgG into the eye.

Complement components amplify the sequence of complement activation while IgG coats the PMMA, forming immunoglobulin aggregates. PMMA bound IgG further activates compliment. Leucocytes are augmented as a result of degeneration of C5 derived chemotactic peptides like cells, keratic precipitates and hypopyon.

Anterior chamber cellular reaction is comparable with other studies like Lt. col. Jha, et al[4] conducted a study which shows 3% moderate AC reaction at postoperative 8 weeks. R. Venkatesh R et al[5] had 3.2%, Sudhakar et al[6]study had 4.2% with moderate anterior chamber reaction has compared to present study with 2.85%. Foreign body reaction is less, in the bag placed IOLs when compared to sulcus fixated IOLs [7].They concluded that single piece IOL is better than three piece IOL in uveitic patients.

LIMITATION: Hydrophobic acrylic, silicone IOLs are not compared with polymethyl methacrylate IOLs.

CONCLUSION: Single piece polymethyl methacrylate IOLs induces less postoperative anterior chamber reaction when compared to three piece IOLs.

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