A COMPARATIVE STUDY OF SURGICALLY INDUCED ASTIGMATISM IN MANUAL SMALL INCISION CATARACT SURGERY AND PHACOEMULSIFICATION IN SENILE CATARACT

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ABSTRACT

BACKGROUND

Cataract surgery is the most frequently performed surgical procedure. The surgical outcome in terms of visual acuity depends on surgical technique and type of intraocular lens used. In this article, we are comparing Manual Small Incision Cataract Surgery (MSICS) and Phacoemulsification in senile cataract.

The aim of this study is to compare the efficacy, visual results of MSICS and phacoemulsification for the treatment of senile cataract.

MATERIALS AND METHODS

Here, we studied 100 patients who were randomly grouped under MSICS and Phacoemulsification group. Both the groups had 50 patients each. Patients were examined at the end of 1st and 6th postoperative weeks and Surgically Induced Astigmatism (SIA) was calculated at 6th postoperative week. The uncorrected and the best-corrected visual acuity was recorded and a slit-lamp examination and auto-refractometer and keratometry examinations were also done.

RESULTS

In our study at 6 weeks post-operatively, we found SIA in SICS group has an average value between 1 and 1.25D with a mean of 1.125D. On the other hand, SIA in Phacoemulsification group has an average value between 0.5D and 0.75D with a mean of 0.625D.

CONCLUSION

The postoperative improvement in visual acuity with manual small incision cataract surgery and with phacoemulsification was good. The improvement in visual acuity with small incision cataract surgery (SICS) was comparable to phacoemulsification, although phacoemulsification gives better visual acuity at 6 weeks. Lower rate of surgically induced astigmatism was found with phacoemulsification when compared to the small incision cataract surgery.

KEYWORDS

Astigmatism, Manual Small Incision Cataract Surgery (MSICS), Surgically Induced Astigmatism (SIA), Phacoemulsification.

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BACKGROUND

Cataract is a major cause of treatable blindness in the world. Approximately, 19 million people in the world are blind as a result of bilateral cataracts.(1) A successful cataract surgery is determined by the best and the earliest possible visual rehabilitation, but the occurrence of postoperative astigmatism is a hurdle to achieve in this goal. Introduction of Phacoemulsification by Kelman and no stitch surgery by McFarland are the major advances in reduction of postoperative astigmatism/ surgically induced astigmatism (SIA) and quick visual rehabilitation.

Astigmatism after the cataract extraction is generally against the rule variety, which is caused by some degree of steepening of the corneal meridian at right angles to the direction of the incision termed as "surgically induced astigmatism" (SIA). This effect was dependent on the size of incision and its proximity to the centre of the cornea. The site of SIA was the internal lip of incision and the changes in the external wound construction do not affect much on the SIA. Longer incision, corneal incision, limbus parallel incision, uniplanar and sutural incision increases SIA.(2)

Manual small incision cataract surgery (MSICS) has emerged as a cost effective alternative to Phacoemulsification in developing world.(3,4) Phacoemulsification machines are expensive to purchase and maintain and they have relatively high cost of surgical consumables. Foldable IOL are cost prohibitive for poor populations. The extensive training that is required for Phacoemulsification is unrelative in health care systems with severe shortage of ophthalmologists. Phacoemulsification is significantly more difficult, time consuming and prone to complications.(5)

In spite of all the short comings about Phacoemulsification, its chief advantage over MSICS is that it can be performed through smaller incision, less corneal complications, visual rehabilitation is comparatively quicker and SIA is comparatively less in Phacoemulsification.(6)

Several centres have reported significant success with high volume, low technology, low cost, sutureless small

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incision extracapsular cataract surgery.[4,7-13] Other studies have showed that manual SICS is clearly more cost effective than alternatives,[14] which includes large incision extracapsular cataract extraction.[15]

Cataract extraction is a simple, but extremely delicate procedure. The surgeon and patients have become increasingly aware of the final optic result of any surgical intervention with the numerous significant advances in surgical methodology that have developed over the past two decades.[16]

For these reasons, Phacoemulsification is considered as the gold standard for cataract surgery in developed world.[17] But in developing country like India for various reasons, mainly socio-economic most experts do not see Phacoemulsification as the answer to the world cataract blindness. Hence, we conducted a comparative clinical study to evaluate parameters like efficacy and visual prognosis in a cost effective procedure like MSICS.

Purpose

To compare the efficacy, visual results and post-operative astigmatism or SIA in manual small incision cataract surgery (MSICS) and Phacoemulsification for the treatment of senile cataract.

MATERIALS AND METHODS

Study Design

A hospital-based, descriptive, comparative study of astigmatism induced by MSICS and Phacoemulsification conducted among 100 patients in the Department of Ophthalmology, GSL Medical College, Rajahmundry.

Study Period

November 2016 to October 2017.

Sample Size

In this study, a convenient sample was taken in the age group of 50 to 80 years. The study included 100 cases who were diagnosed to have cataract. Of them, 50 cases who underwent MSICS and 50 cases who underwent phacoemulsification were grouped randomly based on surgeon's choice.

Inclusion Criteria

1 All patients preferably immature cataracts aged between 50 to 80 years will be selected for study.[18]
2 All patients who had systemic illness like diabetes, hypertension and asthma who are fit for surgery will be included with indication for surgery being patient having significant visual loss due to cataract, so as to effect his routine daily activities.
3 My study includes only grade 1 and grade 2 type of nuclear cataracts and senile cortical cataracts.

Exclusion Criteria

1. All paediatric, traumatic cataract cases will be excluded from study.
2. Patients with hypermature and dense advanced nuclear cataracts will be excluded.
3. Patients with subluxated lens will be excluded.
4. Patients with corneal pathologies like keratoconus, corneal opacities, degenerations and dystrophies will be excluded.
5. Patients with coexisting glaucoma will be excluded.
6. Patients with scleral abnormalities, iris disorders will be excluded.
7. Patient with retinal disease, retinopathies will be excluded from the study.
8. Patient with poor pupil dilatation will be excluded.
9. Patients lost for follow-up will be excluded.

Statistical Analysis

- All statistical analyses were done by using SPSS software trial version 21.0 and MS Excel 2010.
- Descriptive data was presented as percentages and tabulated.
- Chi-square test was done to assess the association among various categorical variables.
- For all statistical analyses, $p < 0.05$ was considered as statistically significant.

A total of 100 cases of cataracts were selected from those attending the OPD. Two groups were created, one for SICS and the other for Phacoemulsification. Random allocation of patients into these groups was done. Fifty patients in each group. Cases selected for study were subjected to detailed history taking and clinical examination.

Visual acuity was assessed with Snellen's chart in all the 100 patients preoperatively and at regular intervals postoperatively. Detailed evaluation of anterior segment was done with slit lamp biomicroscope. Intraocular pressure in both eyes was assessed by Goldmann Applanation Tonometer. Keratometry readings were recorded by Bausch and Lomb Keratometer. Power of the IOL (in diopters) was calculated by biometry (A-Scan).

The surgeries by both techniques were performed by the same surgeon and postoperative conditions remain the same to enable better comparison. Follow-up of each case was done in 1st postoperative week and 6th postoperative week. During each visit UCVA and BCVA, astigmatism by keratometry, AR, slit lamp examination, fundus evaluation and any other postoperative complications were noted.

Consent

Written informed consent was taken from the study participants. Confidentiality of the information is maintained by blinding the study participant's name.

RESULTS

Out of 100 patients, 48 were Male and 52 were Female. Regarding age group, 66 patients were aged between 50 and 60 and 24 patients between 61 and 70, and 10 patients between 71 and 80.

Uncorrected visual acuity (UCVA) better than or equal to 6/18 was seen in 26 patients in MSICS compared to 35 patients in Phacoemulsification. Best Corrected Visual Acuity (BCVA) was seen in 46 patients in MSICS compared to 48 cases in phacoemulsification by the end of Ist postoperative week (Table 1 and 2).

Visual acuity improved in both the groups by the end of 6th postoperative week. The UCVA is better than or equal to 6/18 as seen in 34 patients in MSICS as compared to 43 patients in Phacoemulsification. BCVA better than or equal to 6/18 was seen in 47 patients (94%) in MSICS compared to 49 patients (98%) in phacoemulsification.

Surgically induced astigmatism in most cases in BICS group has an average value between 1 and 1.25D with a mean of 1.125D. On the other hand SIA in phacoemulsification group has an average value of 0.5 - 0.75D with a mean of 0.625D.

Visual Acuity	UCVA (MSICS)	UCVA (PHACO)
6/6-6/9	9 (18%)	11 (22%)
6/12-6/18	17 (34%)	24 (48%)
6/24-6/36	23 (46%)	15 (30%)
6/60	01 (02%)	0
Table 1. Uncorrected Visual Acuity at the End of 1st Week Postop		

(P= 0.253)

Visual Acuity	BCVA (MSICS)	BCVA (PHACO)
6/6-6/9	36 (72%)	41 (82%)
6/12-6/18	10 (20%)	07 (14%)
6/24-6/36	04 (08%)	02 (0 4%)
6/60	0	0
Table 2. Best Corrected Visual Acuity at end of 1st Postop Week		

(P= 0.467)

Visual Acuity	UCVA (MSICS)	UCVA (PHACO)
6/6-6/9	12 (24%)	15 (30%)
6/12-6/18	22 (44%)	28 (56%)
6/24-6/36	16 (32%)	07 (14%)
6/60	0	0
Table 3. Uncorrected Visual Acuity at End of 6th Postop Week		

(P= 0.102)

Visual Acuity	BCVA (MSICS)	BCVA (PHACO)
6/6-6/9	45 (90%)	48 (96%)
6/12-6/18	02 (4%)	01 (2%)
6/24-6/36	03 (6%)	01 (2%)
6/60	0	0
Table 4. Best Corrected Visual Acuity at End of 6th Postop Week		

(P= 0.489)

SIA	MSICS (n=50)	PHACO (n=50)
< 0.50	2	8
0.5 - 0.75	18	28
1.0 - 1.25	24	11
1.5 - 2.00	6	3
> 2.00	0	0
Table 5. Surgically Induced Astigmatism (SIA)		

(P= 0.009)

Age	SICS	PHACO
50-60	34	32
61-70	10	14
71-80	06	04
Total	**50**	**50**
Table 6. Age Distribution		

DISCUSSION

Our study compared the visual outcomes and SIA in phacoemulsification and MSICS. UCVA at the end of Ist postoperative week was better with phacoemulsification, i.e. 70% of the patients show more than or equal to 6/18 when compared to 52% of the patients show more than or equal to 6/18 in MSICS group, which as compared to the study by done by George et al[19] shows 68.2% patients in phaco group and 61.25% in MSICS group had UCVA more than or equal to 6/18 at the end of Ist postoperative week.

In our study at the end of 6 weeks, 68% patients in SICS group and 86% in phacoemulsification group showed UCVA more than or equal to 6/18 as compared to study done by George et al,[19] 71.1% patients in SICS group and 81.08% in phacoemulsification group showed BCVA more than or equal to 6/18.

In our study at the end of 6 weeks, MSICS group was 94% and phacoemulsification was 98% that showed BCVA better than or equal to 6/18. In a study done by Gogate et al[11] showed BCVA better than or equal to 6/18 in 98.5% of patients in phacoemulsification and 97.3% patients in MSICS.

The BCVA better than or equal to 6/18 at the end of Ist postop week was 92% in MSICS group and 96% in phacoemulsification group.

The mean surgically induced astigmatism in MSICS group was 1.125D and in phacoemulsification group was 0.625D. The difference between two techniques was 0.5D. Our results were in accordance with a study done by George et al[19] which showed a mean SIA of 0.95D in MSICS and 0.65D in phacoemulsification (p= 0.001). Cook et al,[20] there was less astigmatism (P= 0.001) at 6 weeks in the eye which had Phacoemulsification.

CONCLUSION

The postoperative improvement in visual acuity with manual small incision cataract surgery and with phacoemulsification was good. The improvement in visual acuity with small incision cataract surgery (SICS) was comparable to phacoemulsification, although phacoemulsification gives better visual acuity at 6 weeks. Lower rate of surgically induced astigmatism was found with phacoemulsification when compared to the small incision cataract surgery.

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