



Assessment of Visual Outcome Following Manual Small Incision Cataract Surgery at Tertiary Care Center

Authors

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Abstract

Aim: Assessment of visual outcome following small incision cataract surgery at a tertiary health center.

Method: This is a descriptive study conducted at Sri Siddhartha Medical College and Hospital, Tumkur for eighteen months period from November 2018 to May 2020. 120 patients who underwent cataract surgery were selected by simple random sampling and were studied and followed up for a period of six weeks.

Results: In our study post operative best corrected visual was 6/6 in 80 (66.6 %) patients, 6/9 in 12 (10.0 %) patients and 6/12 in 28 (23.3 %) patients. In our study 65 (54.1 %) cases developed astigmatism and 55 (45.8 %) cases developed posterior capsular opacification. The most important complication was astigmatic error (54.1%) because superior incision was used in 50 (76.9 %) cases and 15 (23.0 %) cases had IOL induced.

Conclusion: The results in our study compared favorably with results reported from other studies. The magnitude of cataract in our country demands large volume eye surgeries. The study results show that high quality cataract surgery can be attained in a high volume setting.

Well organized cataract screening camps can be conducted combined with efficient base hospital surgery, using a safe surgical technique, which provides early and good Visual outcome can be a strategy to reduce the backlog of cataract blindness in rural communities in developing countries.

Keywords: MSICS, Astigmatism, PCO.

Introduction

Cataract is a significant and increasing global problem with vast economic and social implications¹. It is the principal cause of blindness in India accounting for 62.6%². The prevalence of blinding cataract will only increase as people live longer, so cataract will continue to be, by far, the most important treatable cause of blindness. It is estimated that the present number of 20 million of cataract blind will double by year 2020³.

Conventional extracapsular cataract surgery (ECCE), MSICS, and Phacoemulsification are the three most popular form of cataract surgery in

India and rest of the world⁴. Phaco is the technique of choice in the western world and tertiary care centres in India².

Two randomised controlled trials in Pune, India had found MSICS to be more effective and economical than ECCE and almost as^{5,6} and more economical than phacoemulsification⁷.

In addition to the backlog, an additional 3.8 million become blind each year because of cataract³. In 2000, 3.5 million cataract operations were performed, but this remains insufficient to treat the backlog and the newly blind⁴.

The answer to the backlog of cataract blindness in India has many possible solutions that may differ in various locations. The principal solution to the backlog of cataract blind is performing cataract operations on a large scale. This may be carried out by cataract camps, comprehensive eye care camps and base hospital approach with screening camps. More efforts need to be directed to improve the quality of cataract surgery, through improvement in areas such as case selection and postoperative care, rather than just concentrating on surgical technique and volume. It is only through an integrated approach that the challenge of creating widespread areas to surgical services capable of delivering good quality visual rehabilitation will be met. The effective work of Arvind Hospital System is the testimony of this¹.

Efforts to tackle cataract blindness in India have been going on in earnest for the last three decades. The revolutionary idea of holding surgical eye camps in make shift hospitals started in the late 1960s and was extremely popular until Arvind Eye Hospital changed this strategy by conducting screening camps, then transfer to the base hospital and subsequent surgery in the base hospital using permanent infrastructure already available⁶.

The advantages of base hospital approach stem from utilization of optimal management for pre-operative, operative and post-operative care of patients⁷. Also surgeons are more comfortable operating in a fixed, familiar environment, resulting in better surgical quality and more cost effectiveness⁶.

It is important to be cautious that in our frenzy to fulfil unrealistic targets, we do not blunder so that by our mishap the cataract which only causes curable blindness is turned into complication leading to incurable blindness. A stark reminder comes from the Khurja nightmare where a camp was held in 1986 by a private eye surgeon from another state who operated 88 cataract cases in one camp and 15 more cases at another camp at Moradabad and ended up causing incurable blindness in 84 of the 88 operated cases in one location and all 15 cases in second⁸.

Cataract extraction is the most frequently performed operation in patients over 65 years of age⁹. Due to continued improvement in surgical technique, lens design and manufacturing, the incidence of complications of cataract surgery with intraocular lens implantation have decreased in recent years. Late postoperative complications include IOL malposition, secondary glaucoma, PCO, cystoid macular edema, retinal detachment, and pseudophakic bullous keratopathy¹⁰. Postoperative complications though inevitable, adequate preventive measures such as timely diagnosis and appropriate management of complications can decrease ocular morbidity. The study has been undertaken to study the visual outcome and late post-operative complications of cataract surgery.

Astigmatism after SICS with PCIOL may be due to incision length, shape, orientation, and suture technique and material are factors. Posterior capsular opacification occurs as a result of formation of opaque secondary membranes by active lens anterior epithelium proliferation, transformation of lens epithelium calls into fibroblasts, and collagen deposition.

Glaucoma after cataract surgery does not always result from surgery but also from postoperative interventions such as Nd-YAG Capsulotomy. Postoperative complications though inevitable, adequate measures such as timely diagnosis and appropriate management of complications can decrease ocular morbidity.

The study has been undertaken to study the complications of cataract extraction in eye surgeries.

Materials and Methods

This is a descriptive study conducted at Sri Siddhartha Medical College and Hospital, Tumkur for eighteen months period from November 2018 to May 2020. 120 patients who underwent cataract surgery were selected by simple random sampling and were studied and followed up for a period of six weeks.

Inclusion Criteria

- All patients undergoing small incision cataract surgery.
- Patients with diabetes and/or hypertension without any ocular manifestations.

Exclusion Criteria

- Previous ocular trauma,
- Complications like subluxation or dislocation of the cataractous lens
- Lens induced Glaucoma
- Previous intra ocular surgery
- Patients with secondary cataract, complicated cataract, anterior uveitis.
- Immunocompromised patients.

Each patient was subjected to detailed history taking, followed by ocular examination as per the predesigned proforma.

Pre-operative evaluation was done which included:

1. External ocular examination.
2. Visual acuity testing for distance vision and near vision using Snellen's distant chart And Jaeger's chart respectively.
3. Refraction and correction wherever required.
4. Slit lamp bio-microscopic examination for details of:
 - a) Cornea
 - b) Type of cataract
 - c) Grade of cataract.
 - d) Anterior Lens capsule Assessment
5. Intraocular pressure using Goldman tonometer.
6. Gonioscopy (if done) with Goldmann three mirror lens in patients.

7. Fundus examination using 90 D lens and slitlamp.
8. Keratometry reading.
9. A-scan for determining IOL power.
10. Routine blood investigations like RBS, HbsAg and HIV.
11. Intraoperative complications,

▪ Iridodialysis	Y/N
▪ Lens dislocation.	Y/N
▪ Lens subluxation.	Y/N
▪ Posterior capsular rupture.	Y/N
▪ Vitreous loss.	Y/N
▪ Retained lens matter.	Y/N
▪ Zonular dialysis.	Y/N
▪ De-centered IOL.	Y/N
▪ Posterior capsular rent.	Y/N
▪ Any others.	Y/N

Post Operative Evaluations -

Was done on post operative day 1, post operative day 7 and after 6 weeks postoperative.

- 1.1 External ocular examination.
- 1.2 Visual acuity testing for distance vision and near vision using Snellen's distant chart and Jaeger's chart respectively.
3. Refraction and correction.
4. Slit lamp bio-microscopic examination for details of:
 - a) Cornea.
 - b) Placement of IOL.
 - c) Posterior capsule evaluation.
 - d) Fundus examination using 90 D lens.

Results

The current study was carried out for a period of eighteen months at Sri Siddhartha Medical College and Hospital, Tumkur. A total of 120 patients following manual small incision cataract surgery were evaluated.

Table 1 Distribution of patients according to age in years;

Age in Years	No. of Patients	Percent
41 - 50	31	25.8 %
51 - 60	30	25.0 %
61 - 70	29	24.1 %
71 - 80	30	25.0 %
Total	120	100 %

The above tabular column shows cataract in different age group. In our study the age range of patients was between 40 – 80 years. There were 31 (25.8 %) patients in 41 – 50 years age group,

30 (25.0 %) patients in 51 – 60 years age group, 29 (24.1 %) patients in 61 – 70 age group and 30 (25.0 %) patients in 71 – 80 age group.

Fig 1: Distribution of patients according to age.

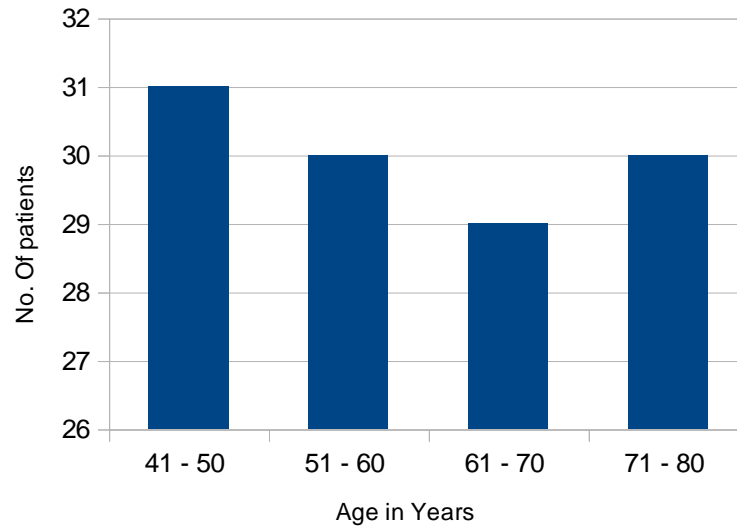


Table 2 Distribution of cases according to gender

Gender	No. of Patients	Percent
Male	64	53.3 %
Female	56	46.6 %
Total	120	100 %

Out of 120 patients 64 (53.3 %) were male and 56 (46.6 %) were female.

Fig 2: Distribution of cases according to Gender

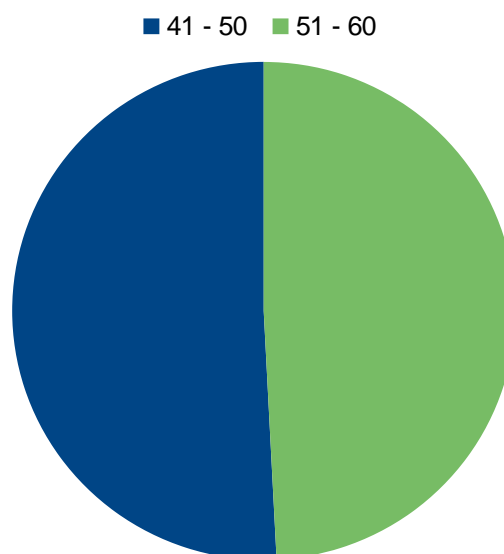
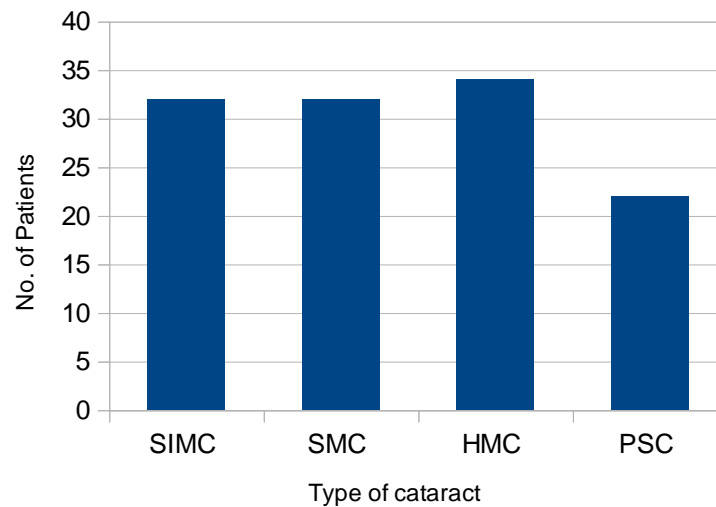


Table 3 Distribution of cases according to Type of Cataract.

DIAGNOSIS	Frequency	Percent
SIMC	32	26.6 %
SMC	32	26.6 %
HMC	34	28.3 %
PSC	22	18.3 %
Total	120	100 %

In our study, cataract was immature in 32 (26.6 %) cases, mature in 32 (26.6 %) cases, hypermature in 34 (28.3 %) cases and posterior subcapsular in 22 (18.3 %) cases.

Fig 3: Distribution of cases according to type of cataract**Table 4** Distribution of patients according to Pre – op uncorrected visual acuity

PRE-OP UCVA	No. of Patients	Percent
PL +	12	10.0 %
HM	14	11.6 %
1/60	18	15.0 %
2/60	13	10.8 %
3/60	9	7.5 %
5/60	8	6.6 %
6/60	32	26.6 %
6/36	14	11.6 %
Total	120	100 %

In our study, 12 (10.0 %) patients had pre - operative visual acuity of perception of light, 14 (11.6 %) patients had hand movement, 18 (15.0 %) patients had 1/60, 13 (10.8 %) patients had

2/60, 9 (7.5 %) patients had 3/60, 8 (6.6 %) patients had 5/60, 32 (26.6 %) patients had visual acuity of 6/60 and 14 (11.6 %) patients had 6/36.

Fig 4: Distribution of patients according to Pre-op UCVA

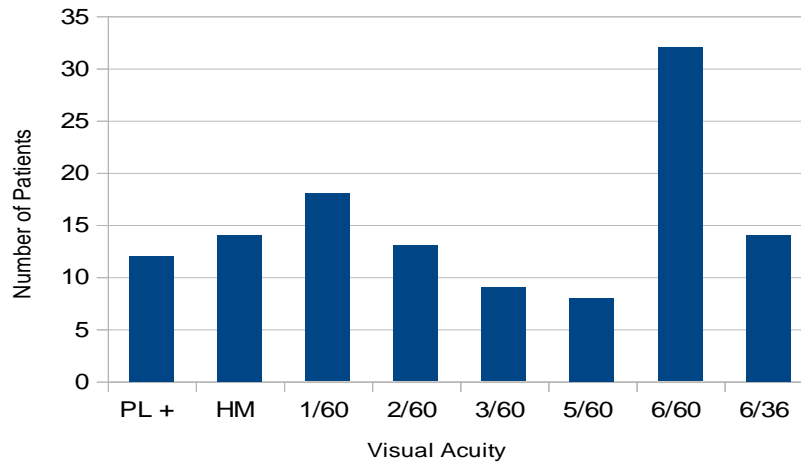


Table 5 Distribution of patients according to pre-operative best corrected visual acuity.

PRE-OP BCVA	No. of Patients	Percent
PL +	12	10.0 %
HM	14	11.6 %
1/60	18	15.0 %
2/60	13	10.8 %
3/60	9	7.5 %
5/60	8	6.6 %
6/60	11	9.1 %
6/36	9	7.5 %
6/24	21	17.5 %
6/18	5	4.1 %
Total	120	100 %

In our study, 12 (10.0 %) patients had pre-operative visual acuity of perception of light, 14 (11.6 %) patients had hand movement, 18 (15.0 %) patients had 1/60, 13 (10.8 %) patients had 2/60, 9 (7.5 %) patients had 3/60, 8 (6.6 %)

patients had 5/60, 11 (9.1 %) patients had visual acuity of 6/60, 9 (7.5 %) patients had 6/36, 21 (17.5 %) patients had visual acuity of 6/24 and 5 (4.1 %) patients had visual acuity of 6/18.

Fig 5: Distribution of patients according to Pre-op BCVA

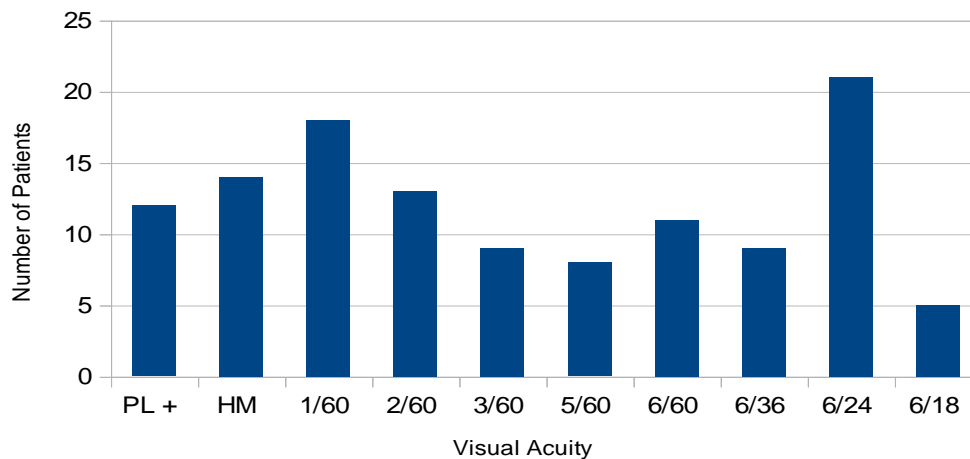
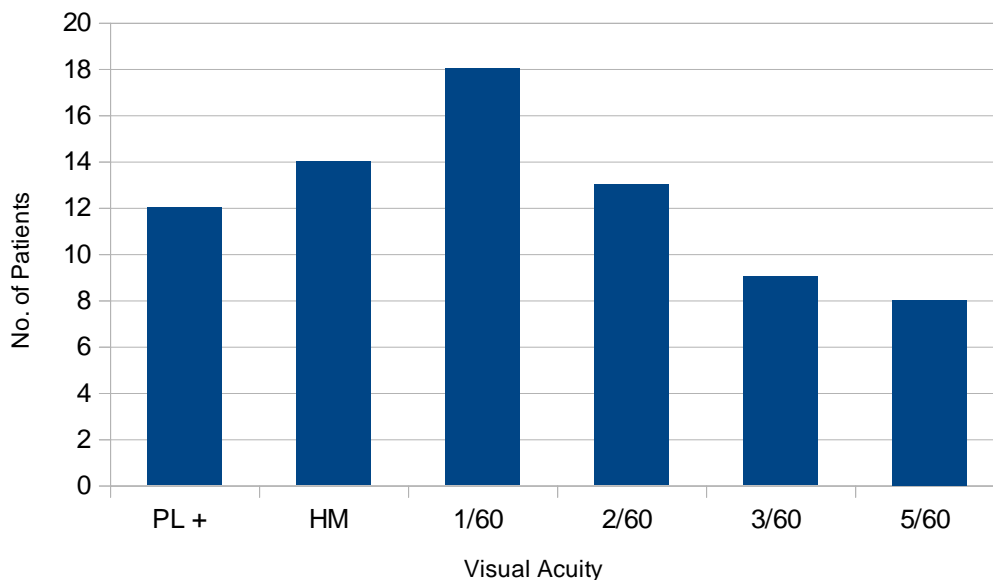


Table 6 Distribution of patients according to Post – op UCVA

POST-OP UCVA	No. of Patients	Percent
6/6	24	20.0 %
6/9	21	17.5 %
6/12	17	14.1 %
6/18	16	13.3 %
6/24	23	19.1 %
6/36	19	15.8 %
Total	120	100 %

In our study post operative uncorrected visual was 6/6 in 24 (20.0 %) patients, 6/9 in 21 (17.5 %) patients, 6/12 in 17 (14.1 %) patients, 6/18 in 16

(13.3 %), 6/24 in 23 (19.1 %) patients and 6/36 in 19 (15.8 %) patients.

Fig 6: Distribution of patients according to post-op UCVA.**Table 7** Distribution of patients according to Post – op BCVA.

POST-OP BCVA	No. of Patients	Percent
6/6	80	66.6 %
6/9	12	10.0 %
6/12	28	23.3 %
Total	120	100 %

In our study post operative best corrected visual was 6/6 in 80 (66.6 %) patients, 6/9 in 12 (10.0 %) patients and 6/12 in 28 (23.3 %) patients.

Fig 7: Distribution of patients according to Post-op BCVA

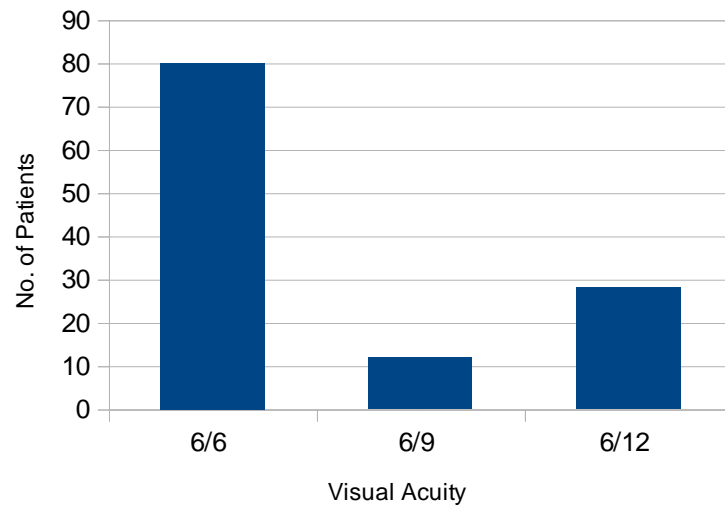


Table 8 Causes of decreased vision at 6 weeks post – op.

Causes of decreased VA	No. of Patients	Percent
Astigmatism	65	54.1 %
PCO	55	45.8 %
Total	120	100 %

In our study 65 (54.1 %) cases developed astigmatism and 55 (45.8 %) cases developed posterior capsular opacification.

Fig 8: Causes of decreased vision at 6 weeks

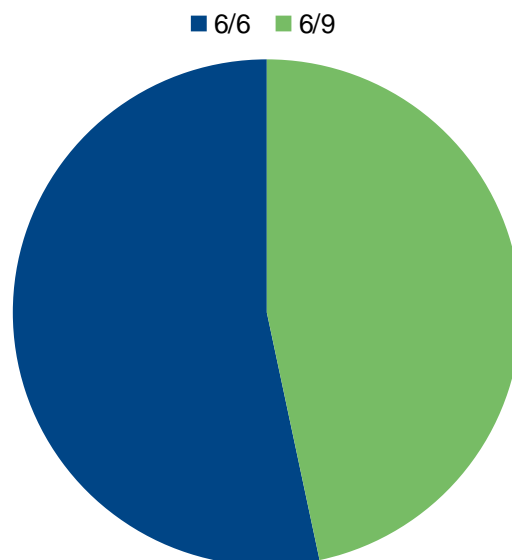
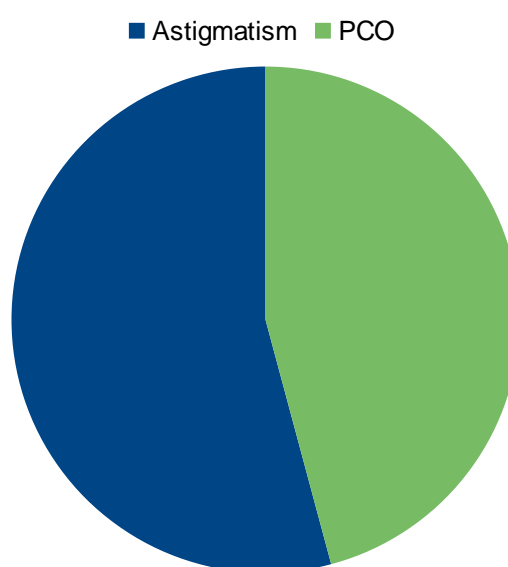


Table 9 Cause of Astigmatic Error

Astigmatic Error	No. of Patients	Percent
Incision Induced	50	76.9 %
IOL Induced	15	23.0 %
Total	65	100 %

In our study 50 (76.9 %) patients had incision induced astigmatism as in these patients superior incision of 5.5 – 6.0 mm was taken.

15 (23.0 %) cases had IOL induced astigmatism due to placement of the lens in the sulcus and partly in sulcus and partly in bag.

Fig 9: Causes of Astigmatic Error

Discussion

Cataract remains the major cause of blindness throughout the world. Cataract surgery continues to be evolutionary. Quality of vision and early rehabilitation are two of the critical parameters that determine the success of modern cataract surgery.

This study has been undertaken with the principle aim to find out the visual outcome and the causes of decreased vision following manual small incision cataract surgery at 6 weeks. 120 patients who underwent cataract surgery at Sri Siddhartha Medical College and Hospital were studied and evaluated for postoperative visual outcome and complications.

In our study the age range of patients was between 40 – 80 years. There were 31 (25.8 %) patients in 41 – 50 years age group, 30 (25.0 %) patients in 51 – 60 years age group, 29 (24.1 %) patients in 61 – 70 age group and 30 (25.0 %) patients in 71 – 80 age group. Ilechie et al, in their study had a sample size of 1288. Their mean age for study was 64.4+ 16.7years. Their patients aged from 40-80 years¹¹.

Males constituted the majority 65 (53.3 %) of the patients as compared to females 56 (46.6%) in the present study. It reflects higher incidence of cataract among female population. Hosamani and Vallabha: Efficacy of small incision cataract surgery showed 34 (21%) males and 130 (79%) females¹².

In our study, cataract was immature in 32 (26.6 %) cases, mature in 32 (26.6 %) cases, hypermature in 34 (28.3 %) cases and posterior subcapsular in 22 (18.3 %) cases. Patients had pre - operative visual acuity of perception of light, 14 (11.6 %) patients had hand movement, 18 (15.0 %) patients had 1/60, 13 (10.8 %) patients had 2/60, 9 (7.5 %) patients had 3/60, 8 (6.6 %) patients had 5/60, 32 (26.6 %) patients had visual acuity of 6/60 and 14 (11.6 %) patients had 6/36. Patients constituted mainly rural population. Patients ignorance and economic status does not allow them to meet ophthalmologist at the earliest.

In our study, 12 (10.0 %) patients had pre - operative visual acuity of perception of light, 14 (11.6 %) patients had hand movement, 18 (15.0 %) patients had 1/60, 13 (10.8 %) patients had 2/60, 9 (7.5 %) patients had 3/60, 8 (6.6 %) patients had 5/60, 11 (9.1 %) patients had visual acuity of 6/60, 9 (7.5 %) patients had 6/36, 21 (17.5 %) patients had visual acuity of 6/24 and 5 (4.1 %) patients had visual acuity of 6/18. In our study post operative uncorrected visual was 6/6 in 24 (20.0 %) patients, 6/9 in 21 (17.5 %) patients, 6/12 in 17 (14.1 %) patients, 6/18 in 16 (13.3 %), 6/24 in 23 (19.1 %) patients and 6/36 in 19 (15.8 %) patients and post operative best corrected visual was 6/6 in 80 (66.6 %) patients, 6/9 in 12 (10.0 %) patients and 6/12 in 28 (23.3 %) patients.

Sudhakar et al in reported visual acuity of 6/12 or better in 80.7%¹³. Venkatesh et al in their study achieved BCVA of 6/18 or better in 94.4%¹⁴. Ravindra et al reported a BCVA of 6/18 or better in 80.7%, Hening et al and Das et al in their study reported a BCVA OF 6/18 or better in 96.2%¹⁵ and 88.3% respectively.

Das et al, Ravindra et al and Gogate et al in their comparative studies between camps and hospitals reported that full visual acuity was higher in hospitals than in camps¹⁶.

In our study 65 (54.1 %) cases developed astigmatism and 55 (45.8 %) cases developed posterior capsular opacification. Lachie et al, in a study in Ghana had observed 36 patients with late

surgical complications in which PCO post operatively occurred in (50%) eyes among 1288 cases operated on. This corresponds to 2.8% of total cases operated¹¹. In Hollick EJ et al study, among the 23 cases operated on with PMMA IOs, 13(56%) cases developed PCO post-operatively¹⁷. Parikshit M Gogate et al has coated high incidence of PCO in the Pune Study¹⁶ (12/200, 6% in MSICS group verses 7/200, 3.5% in the PHACO group).

Nd-YAG Capsulotomy was performed for all the 55 eyes and VA improved to 6/6-6/9 in majority of the cases. Panezai MN et al, Shawani MA et al and Hameed et al 2004 had pre laser VA was between HM to 6/36 which improved to 6/18-6/6 in 91% of eyes¹⁸. Mohammed YK et al in a study reported a visual improvement of 88% in 58 eyes¹⁹. Gregor et al reported that the most effective treatment of PCO is Nd-YAG Laser Capsulotomy²⁰.

In our study 50 cases(76.9%) had incision induced astigmatism. 15 cases (23 %) had IOL induced astigmatism due to IOL placement in the sulcus and partly in the sulcus and partly in the bag due to some intraoperative complications. Gurung et al have reported astigmatism of >-2D at 6 weeks in 35.4% of the cases²¹. Our results were comparable to this study. Reddy et al.,(2007) studied the comparison of astigmatism which was induced by superior and temporal sections in SICS in the Indian population but their study had a smaller group of 64 patients only²². Gokhale et al, compared astigmatism which was induced by superior, supero-temporal and temporal incisions in manual SICS and concluded that the superior incision resulted in more ATR shift where as temporal incision resulted in WTR shift²³. Renu M, et al reported that temporal approach MSICS produces less post operative astigmatism and has manifold advantages over superior incision MSICS with excellent visual outcome²⁴. Jayshree M.P et al reported that in the bag IOL implantation was associated with low level post operative astigmatism and a better technique when

compared with to ciliary sulcus IOL implantation²⁵.

Fortunately we did not observe either cystoid macular edema or bullous keratopathy in any of our cases while Sudhakar et al reported 0.3% incidence of pseudophakic cystoid macular oedema¹³. Desai et al reported a lower incidence 0.05% cystoid macular oedema(0.05%)²⁶. Apple et al reported bullous keratopathy in 1-2% of his cases²⁷. 0.4% incidence was reported by Balmeret al. Gonclaves et al reported bullous keratopathy 1-2% and Taylor et al stated it to be 0.3%²⁸.

Conclusion

This study was done in the Department of Ophthalmology of Sri Siddhartha Medical College & Hospital, Tumkur. 120 cases who underwent MSICS with PCIOL were studied.

In our study post operative best corrected visual was 6/6 in 80 (66.6 %) patients, 6/9 in 12 (10.0 %) patients and 6/12 in 28 (23.3 %) patients.

In our study 65 (54.1 %) cases developed astigmatism and 55 (45.8 %) cases developed posterior capsular opacification.

The most important complication was astigmatic error (54.1%) because superior incision was used in 50 (76.9 %) cases and 15 (23.0 %) cases had IOL induced.

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Conflicts of Interest: There are no conflicts of interest.

Bibliography

1. Garry Brian, Hugh Taylor. Cataract blindness- challenges for the 21 Century. Bulletin of the World Health Organization, 2001; 79: 249-256.
2. Henniga, Kumar), Singh AK, Ansaria, Singhs, Gurung R, Foster A. World Sight Day and Cataract Blindness. Br.J. Ophthalmol,2002;86:830- 831.
3. Natchiar G, RobinAL, Ravilla Detal. Attacking the backlog of India's curable blind. Arch Ophthalmol 1994; 112: 987-93.
3. Basti S, Vasavada AR, Thomas R, Padmanabhan P. Extracapsular cataract Extraction Surgical techniques. Indian J Ophthalmol. 1993; 41: 19-21.
4. Gogate PM, Wormald RP, Deshpande M, Deshpande R, Kulkarni SR. Extracapsular cataract surgery compared with manual small incision cataract surgery in community eye care setting in western India: A randomized controlled trial. Br J Ophthalmol. 2003; 87: 673-9.
5. Gogate PM, ,Deshpande R, Kulkarni SR, Krishnaiah S, Joshi SA, Palmiker A, et al . Safety and Efficacy of phacoemulsification compared with manual small incision cataract surgery by a randomized controlled clinical trial : Six weeks results. Ophthalmol .2005; 112: 869 -74.
6. Manual small incision cataract surgery is almost as effective and more economical. Ophthalmology. 2007; 114: 965-8.
7. Gogate PM, Deshpande MD, Nirmalan P. Why do Phacoemulsification? Manual small incision cataract surgery is almost as effective and more economical. Ophthalmolgy. 2007; 114: 965-68
8. Khosla PK. Community Ophthalmology: An Indian Perspective-Current Scientific Literature. New Delhi, 1992: 113-116.
9. Jaffe NS, Jaffe MS, JaffeGF. Cataract surgery and its complications, 6""ed., St. Louis: Mosby, 1999. Daniel F, Goodman DF, Walter), StackW), Goltsch JD. Complications of Cataract extraction with intraocular lens implantation. Ophthalmic Surgery, Feb. 1989; 20(2): 132-140.
10. Alex A Techie, B S Bodi , O V Ndudin, E A Ofori. Evaluation of Post. Evaluation of post operative visual outcomes of cataract surgery in Ghana International Journal of Health Research 2012 March; 5 (1) :35-42.
11. Sushma A Hosamani, Vallabha K, Efficacy of Small Incision Cataract Surgery in Hospital Based eye Camps in North

- Karnataka. Journal of Clinical Ophthalmology and Research 2014; 2 (1) :13-14.
12. Sudhakar J, Ravindra RD, Natchiar G. Analysis of complication in 1000 posterior chamber intraocular Ophthalmology: 37 (2) : 78-79. lens implantation. Indian J.
 13. Based eye Camps in North Karnataka. Journal of Clinical Ophthalmology and Research 2014; 2 (1):13-14
R Venkatesh, R Muralikrishnan, Linda Civerchia Balent, S Karthik Prakash , N Venkatesh Prajna. Outcomes of high volume cataract surgeries in a developing country. Br J Ophthalmology 2005 ; 89: 1079-1083.
 14. Gogate PM. Small Incision Cataract Surgery Complications and mini - review. Indian J Ophthalmol 2009; 57 (1): 45-49.
 15. Hollick EJ, Spalton DJ, Ursell PG, Pande MV, Barman SA, Boyce JF, Tilling K. The effect of polymethyl metha acrylate , silicone, and poly acrylic intraocular lenses on posterior capsule opacification 3 years after cataract surgery. Ophthalmology 1999; 106 (1) : 49- 54.
 16. Panezai MN.,Shawani MA and Hameed K (2004). Posterior capsular opacification and Nd: YAG Laser capsulotomy in Helpers Eye Hospital Quetta. Pak J Ophthalmol, 20: 115-8
 17. Mohammad YK., Sanaullah J., Mohammad NK., Shafqatullah K and Niamatullah K (2006). Visual outcome after Nd-YAG capsulotomy in Posterior Capsular Opacification. Park J Ophthalmol, 22:87-89.
 18. Gregor Hawlina, Brigita et al. Nd: YAG laser Capsulotomy for Treating Posterior Capsular Opacification Journal of the Laser and Academy 2013; 1:34-35.
 19. Gurung A, Karki DB, Shreshta S, Rijal AP. Visual outcome of conventional extracapsular cataract extraction with posterior chamber intraocular lens implantation vs manual small- incision cataract surgery. Nepal J Ophthalmol. 2009 Jun;1(1): 13-19.
 20. Reddy, Amit Raj, Virendra Pratap Singh Site of incision Corneal and Astigmatism in Conventional SICS Vs Phacoemulsification. Annals of Ophthalmology 2007; 39 (3): 209-216.
 21. Gokhale NS, Sawhney S. Reduction in astigmatism in manual small incision cataract surgery through change of incision site. Indian J Ophthalmol 2005 : 53 :201-3.
 22. Renu M Magdum. Abha Gahlot, Rupali D, Khevna Patel. A comparative study of surgical Induced Astigmatism in superior and temporal scleral Incision in MSICS . National Journal of Medical Research , Oct-Dec.2012 ; 2(4) : 497-500.
 23. Jayshree M.P, Laxman V Dasari et al. Comparative study of Post operative vision and complication with sulcus fixated IOL and in the bag IOL. Journal of Pharmaceutical and Biomedical Sciences (JPBMS) 2012 ; 14(14) : 1-6.
 24. Parul Desai, D C Minassian, Angela Reidy. National cataract surgery survey 1997-8: a report of the results of the clinical outcomes. Br J Ophthalmol 1999; 83: 1336-1340.
 25. Apple DJ, Mamalis N, Lofthfield K et al. Complications of intraocular lenses: A historical histopathological review. Surv. Ophthalmol 1984 ;29 1054.
 26. Gonclaves ED, Campos m, Paris F, Gomes JA, Farias CC. Bullous Keratopathy: etiopathogenesis de Oftalmologia and treatment. Arquivos Brasileiros 2008 ; 71: 61-64.