Medico Research Chronicles

ISSN No. 2394-3971

Original Research Article

VISUAL OUTCOMES IN CATARACT SURGERY

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Submitted on: April 2016
Accepted on: April 2016
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Abstract;
Objective: Analysis of visual outcome in various methods of cataract surgery as per WHO guidelines at a tertiary care centre
Design: A Hospital based study on 824 eyes of 824 patients with senile cataract without comorbid ocular or systemic conditions who gave consent.
Materials: Manual SICS with sclerocorneal incision, Manual SICS with Clear Corneal Incision and Phacoemulsification were performed by multiple Ophthalmic Surgeons. Patients were followed up on Days 1, 7, 15 and Months 1, 3, 6 and 12.
Results: Manual small incision cataract surgery with clear corneal tunnel was performed in majority of cases. Out of 824 patients, 781 came for 8 week follow up after surgery. Out of 781 cases, good visual outcome seen in 86.43% patients which meet WHO guidelines. Intraoperative complications (8.25%) were the major cause affecting visual outcome. Intraoperative complications occurred in total 77 (9.8%) patients which short falls of the maximum limit of 10% as per WHO guidelines. Posterior Capsule Rent 30 patient (3.64%) is most common intraoperative complication followed by PC rent with vitreous loss 26 (3.32%). Rate of both complications is well below the maximum limit of 5% as per guidelines given by WHO.
Conclusion: Visual outcome of cataract surgery at our tertiary care hospital fairly meets the WHO guidelines. Intraoperative complications and retained lens material are important causes of low visual outcome at our hospital. This study shows that scope of improvement at our hospital lies in reducing intraoperative & postoperative complications and their management
Key words: WHO- world health organization, SICS- small incision cataract surgery, PC- posterior capsule

Introduction

Cataract is the world's leading cause of blindness. In India Cataract accounts for 62.6% of total blindness.[2] Recognizing this, the main emphasis of the National Program for Control of Blindness (NPCB) in India was on cataract blindness control.[3] Several studies haveIndicated that the long term visual outcome of cataractsurgery is often far from optimal.[7]The need to maximise visualoutcome after cataract surgery is obvious and routinemonitoring of outcome can be a mechanism to achievethis.[10,11,12.]

Causes of poor visual outcome can be classified in four groups:

1. Selection: due to pre-existing or concurrent eye disease
2. Surgery: due to surgery or immediate pre-operative or post-operative complications
3. Spectacles: due to inadequate optical correction
4. Sequels: due to late post-operative complications (posterior capsule opacification, retinal detachment, etc.)

The ultimate objective of cataract surgery is to remove visual disability by restoring visual function. Visual acuity is the indicator that is easiest to perform and universally applied as a routine by ophthalmologists and paramedicalstaff.[13]Present study attempts to evaluate visual outcome of senile cataract surgery in terms of visual acuity &to identify the main causes of poor outcome at tertiary care hospital.

Aims and Objectives

Presenting study has following aims & objectives

1. To evaluate results of cataract surgery.
2. To analyze visual outcome of cataract surgery.
3. To identify causes of poor outcome.
4. To suggest suitable recommendations based upon study findings.

Materials and Methods: Visual outcome is crucial both for the patients and for the eye care provider. Good outcomes are essential and poor outcomes experienced by patients following surgery will affect the demand for cataract surgery by the community. In this study attempt was made to evaluate visual outcome of cataract surgery & understand the causes of low visual outcome.

- **Study type:** Longitudinal analytical study
- **Study design:**prospective
- **Place:** Tertiary Care Hospital
- **Duration:** March 2013 to May 2014
- **Study Population:** Patients admitted for cataract surgery in department of ophthalmology**.**
- **Inclusion criteria:**
  - ❖ All senile cataract patients
  - ❖ above the 50 years of age
  - ❖ Admitted in department of ophthalmology during March 2013-14
- **Exclusion criterion:**
  - ❖ Complicated cataract
  - ❖ Traumatic cataract
  - ❖ Any posterior segment pathology
- **Ethical clearance**: after approval from ethical committee.

An informed consent was obtained from every patient. Cases were collected using piloted proforma meeting the objectives of the study.

On the day of admission thorough pre operative evaluation was done.

- Slit lamp biomicroscopy
- Fundus examination
- Calculation of IOL power.
- Informed consent was taken from all the patients before surgery.
- Cataract surgery was done under peribulbar anaesthesia. After taking all aseptic precautions eyes were draped, wire speculum was placed, superior rectus bridle suture was passed and clamped on to the to the towel. Surgery was done under operating microscope

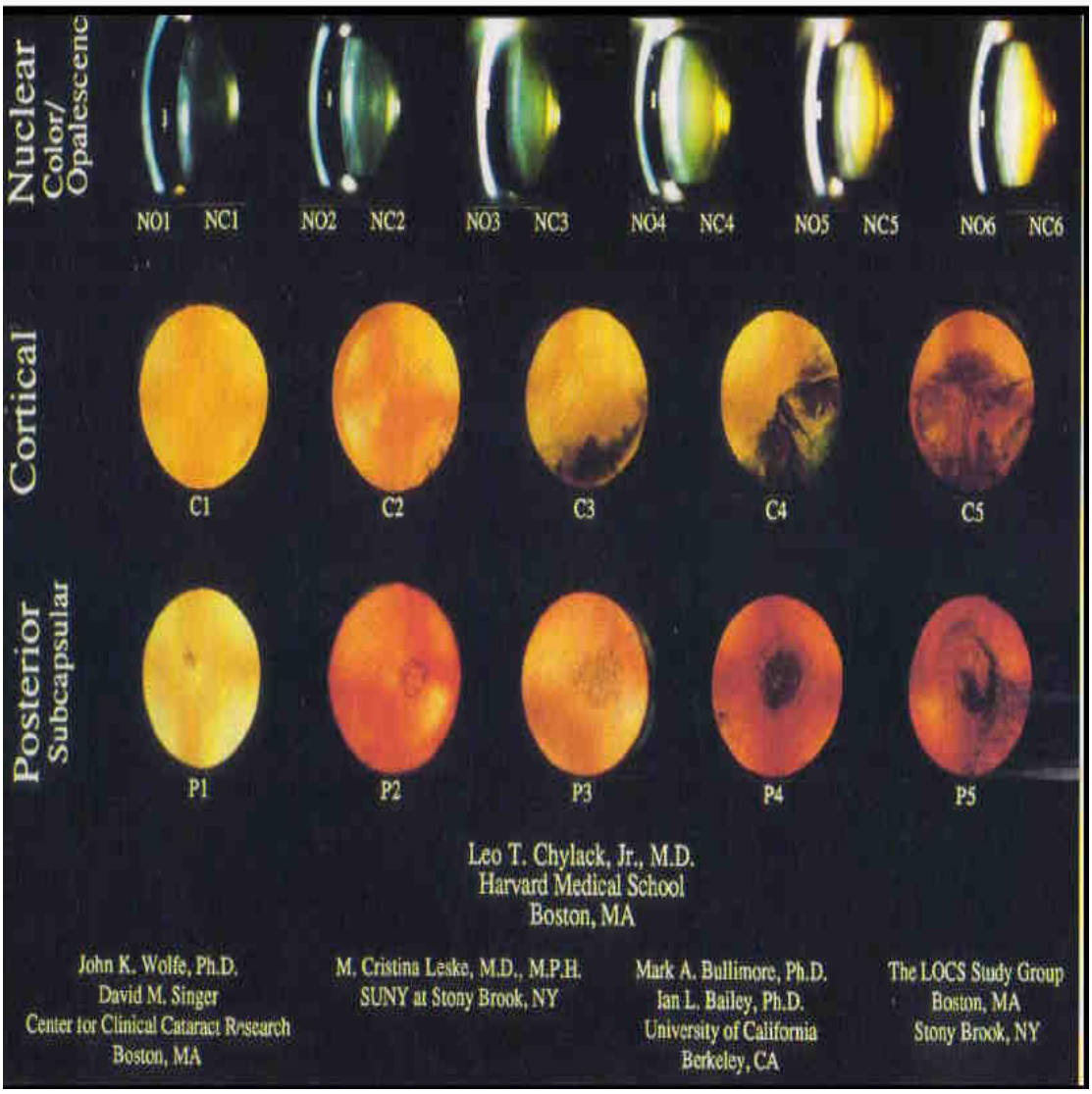


Figure 1: Lens Opacity Classification System (LOCS III)

Cataract surgery was performed by various experienced ophthalmologists. Manual small incision cataract surgery with either sclero-corneal or clear corneal tunnel or phacoemulsification was the techniques performed.

Follow up

- Patients were followed up on first postoperative day and discharged.
- Follow up of patients done on 1st, 4th& 8th week.
- Early postoperative complications recorded & managed.
- Complete ophthalmological evaluation conducted at each visit including visual acuity; slit lamp biomicroscopy, direct & indirect ophthalmoscopy. Spectacle correction given where needed.
- Best corrected visual acuity recorded at 8th week, analyzed irrespective of type of surgery done & categorized according to guidelines given by WHO (World Health Organisation).

Table 1 : WHO guidelines for postoperative visual outcome

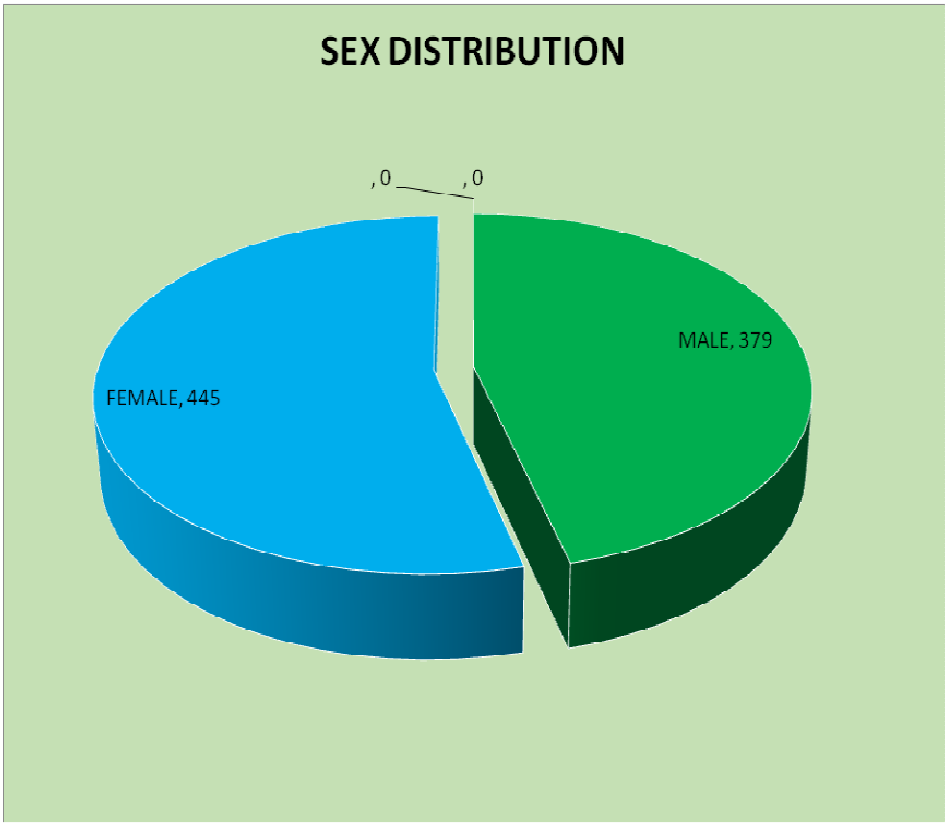
Visual outcome	With available correction	With best correction
Good 6/6-6/18	>80%	>90%
Borderline <6/18-6/60	<15%	<5%
Poor <6/60	<5%	<5%

*Available Correction: Functioning visual acuity
*Best Correction: With pinhole or adequate spectacle correction.

Observations and Results:

Table 2: Sex Distribution

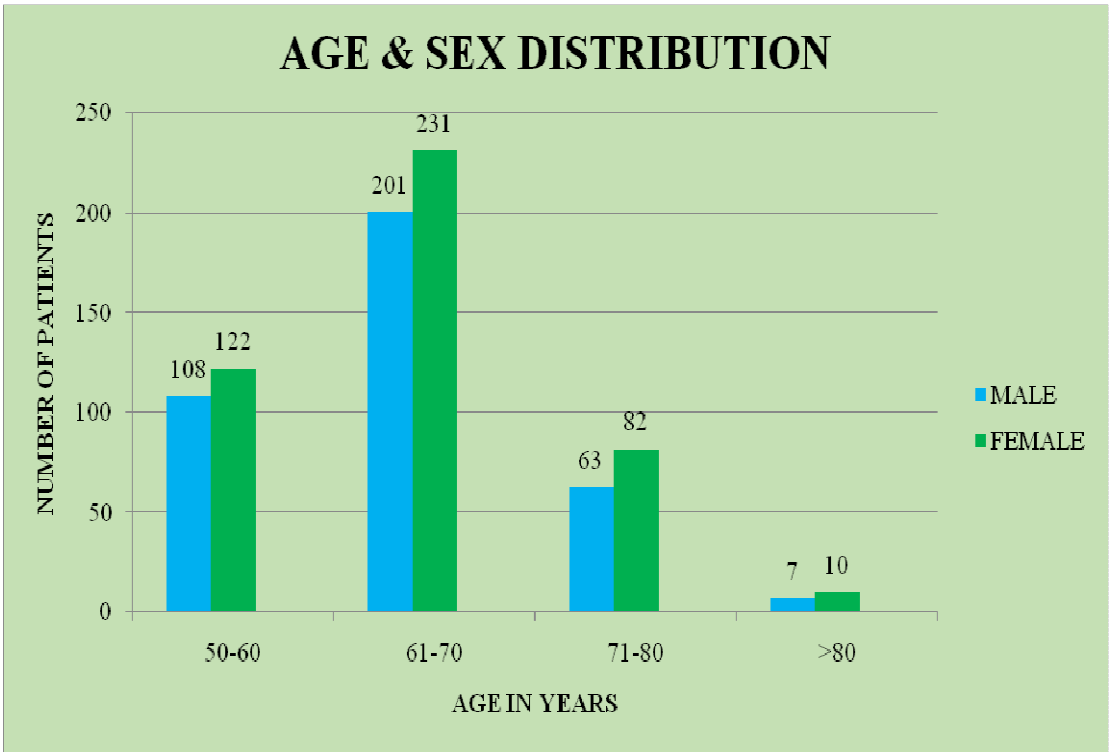
Sex	Number of cases	Percentage (%)
Male	379	46
Female	445	54
Total	824	100



Out of 824 patients, 445 (54%) were females & 379 (46%) were males.

Table 3: Age & Sex Distribution

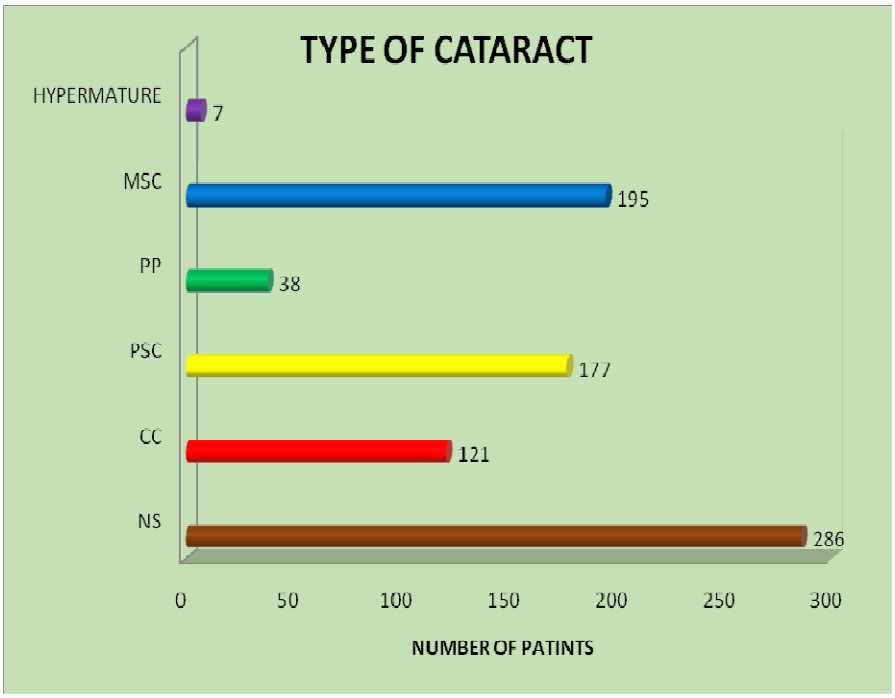
Age group (years)	Male	Female	Total	Percentage (%)
50-60	108	122	230	27.91
61-70	201	231	432	52.43
71-80	63	82	145	17.60
≥81	7	10	17	2.06
TOTAL	379	445	824	100



Out of 824 cases, patients in the 61 to 70 years age group were maximum accounting for 432 cases. 17 patients were above 80 years. Mean age group being 64.9 years.

Table 4: Type Of Cataract

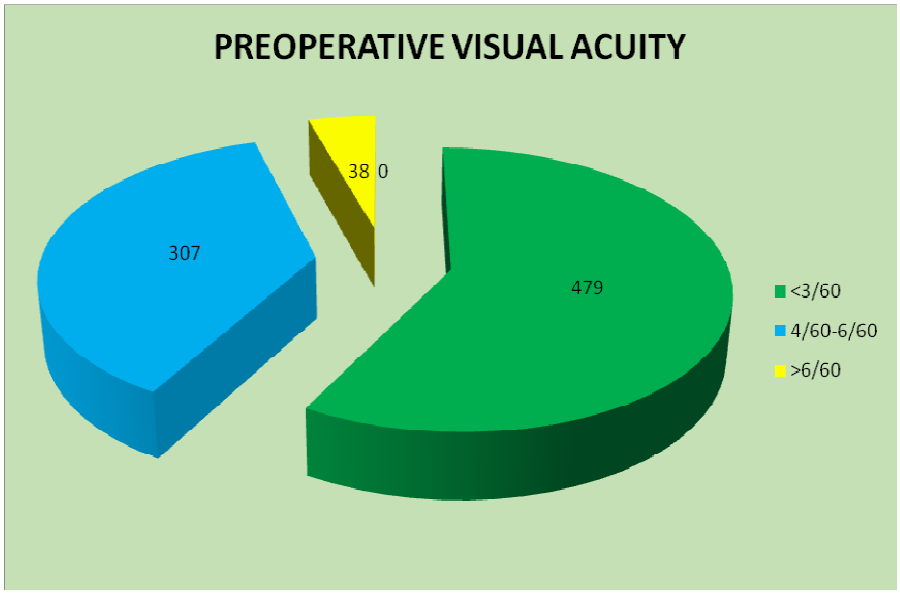
Type of cataract	Number of cases	Percentage (%)
Nuclear sclerosis	286	34.70
Cortical	121	14.68
Posterior subcapsular	177	21.48
Posterior polar	38	4.61
Mature	195	23.68
Hypermature	7	0.84
Total	824	100



In 824 patients, nuclear sclerosis was common & seen in 266 (34.7%) of patients.

Table 5: Preoperative Visual Acuity

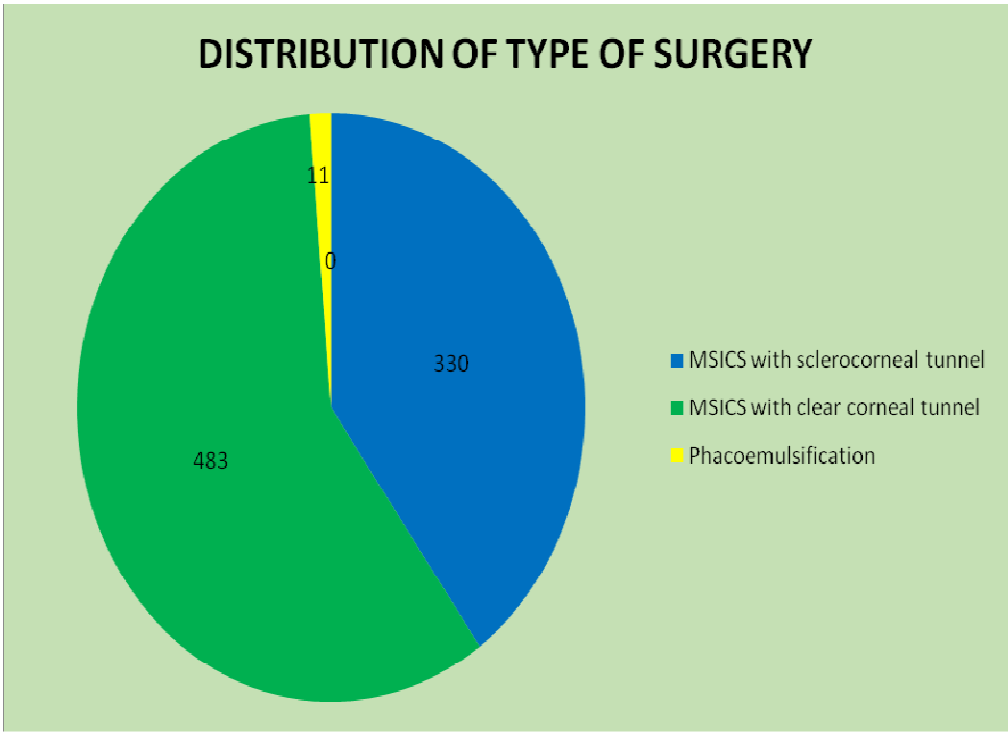
Visual acuity	Number of cases	Percentage (%)
≤3/60	479	58.13
4-60-6/60	307	37.26
>6/60	38	4.61
TOTAL	824	100



Preoperative visual acuity was classified into three groups. Majority of the patients had visual acuity less than 3/60 (58.13%).

Table 6: Distribution of type of surgery done

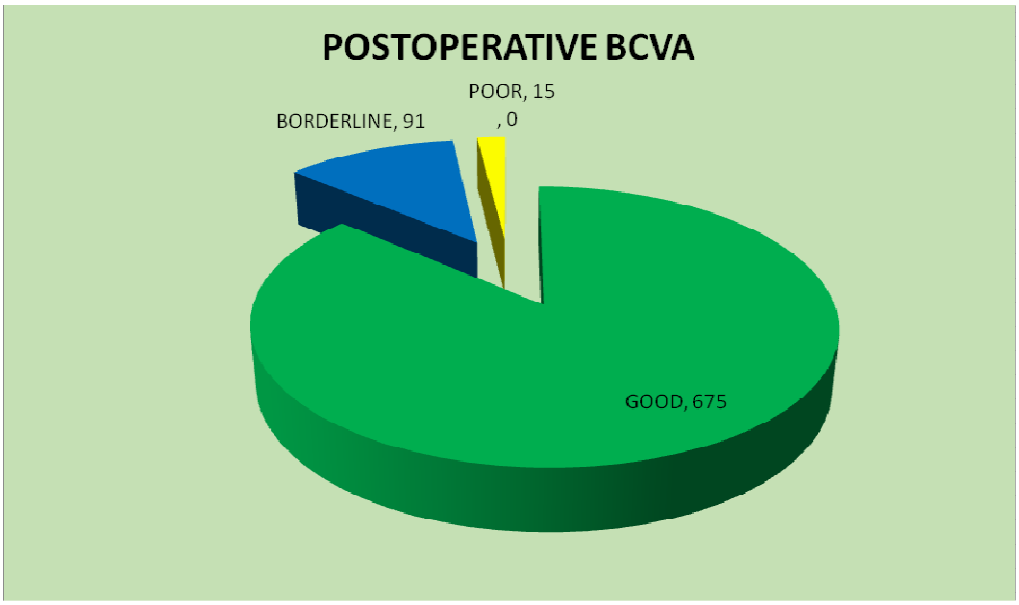
Type of surgery	Number of cases	Percentage (%)
MSICS with sclerocorneal tunnel	330	40.06
MSICS with clear corneal tunnel	483	58.61
phacoemulsification	11	1.33
Total	824	100



Manual small incision cataract surgery with clear corneal tunnel was the technique used in majority of cases.

Table 7: Postoperative BCVA at 8 weeks

Postoperative bcva	Number of cases	Percentage (%)
GOOD (6/6-6/18)	675	86.42
BORDERLINE (6/12-6/60)	91	11.65
POOR (<6/60)	15	1.92
TOTAL	781	100



Out of 824 patients, 781 came for follow up at 8 week following surgery. Out of 781 cases, good visual outcome seen in 86.43% patients which fairly meets the guidelines given by WHO.

Table 8: Causes of borderline & poor outcome

Causes	Borderline outcome	Poor outcome	Total
Intraoperative complications	60	8	68 (8.7%)
Retained lens material	31	6	37 (4.8%)
Others	-	1	1 (0.1%)
Total	91	15	106 (13.6%)

Data of patients with borderline & poor outcome was studied & it is found that intraoperative complications (8.25%) are the major cause affecting the final visual outcome.

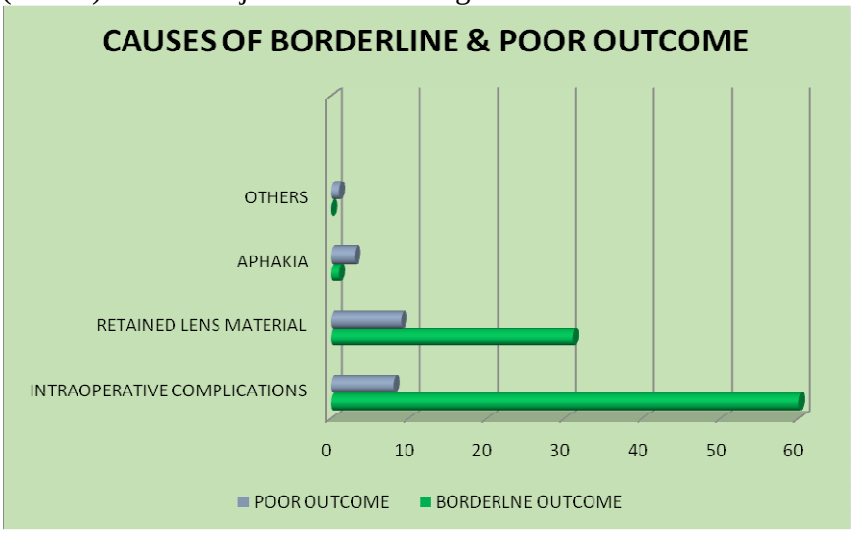
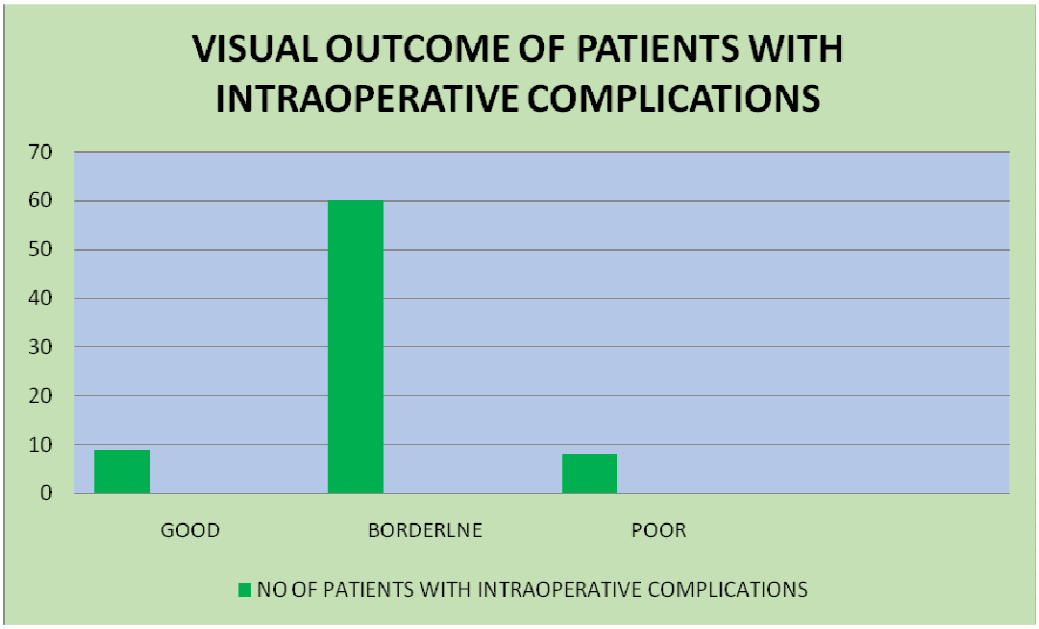


Table 9: Visual outcome of patients with intraoperative complications

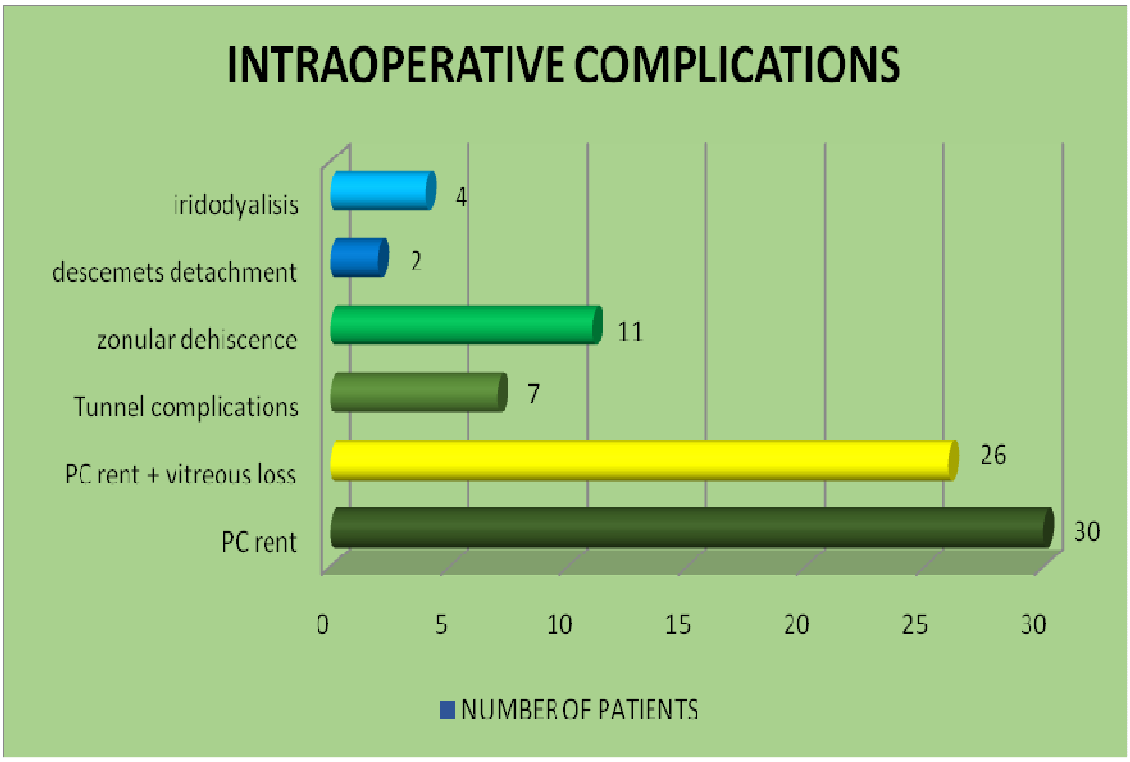
Visual outcome	Number of cases with intraoperative complications
Good	9
Borderline	60
Poor	8
Total	77 (9.7%)



- Intraoperative complications occurred in total 77 (9.8%) patients which shorts fall of the maximum limit of 10% as per guidelines given by WHO.
- 9 patients with some intraoperative complications had good outcome. So introperative complications are responsible for low visual outcome in 68 (8.7%) patients

Table 10: Analysis of total intraoperative complications

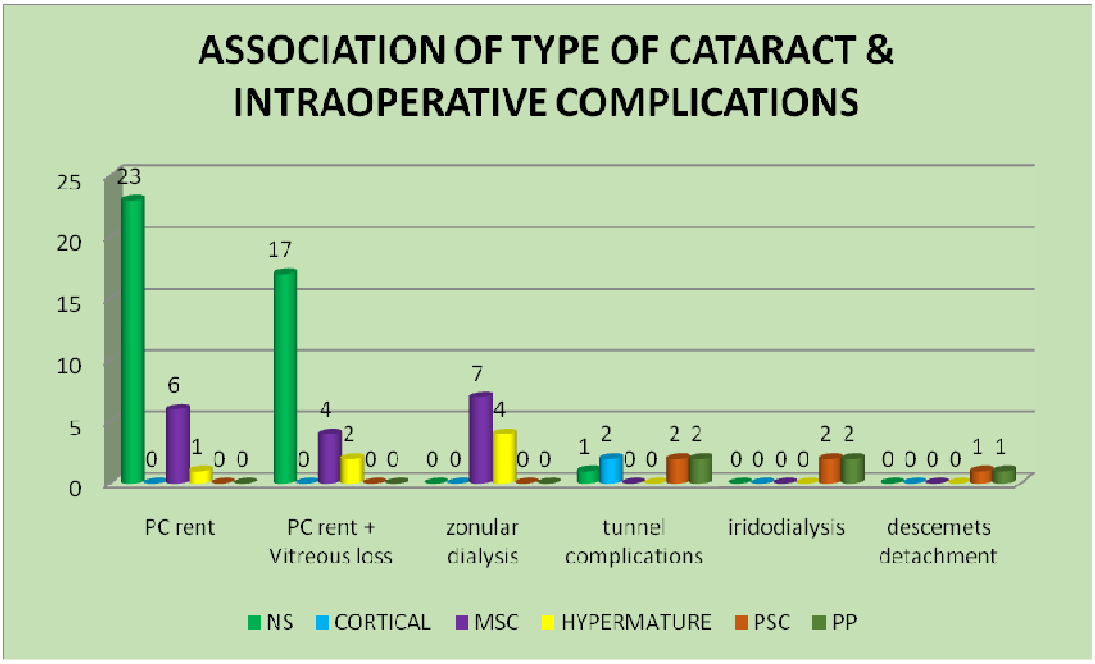
Intraoperative complications	Number of cases	Percentage (%)
PC rent	30	3.64%
PC rent + vitreous loss	23	2.94%
Tunnel complication	7	0.88%
Zonular dehiscence	11	1.40%
Descemets detachment	2	0.25%
Iridodyalisis	4	0.51%
Total	77	9.8%



- PC rent (Posterior Capsule Rent) occurred in 30 (3.64%) patient is most common intraoperative complication followed by PC rent with vitreous loss 26 (3.32%).
- Rate of both complications is well below the maximum limit of 5% as per guidelines given by WHO.

Table 11: Association of type of cataract & intraoperative complications

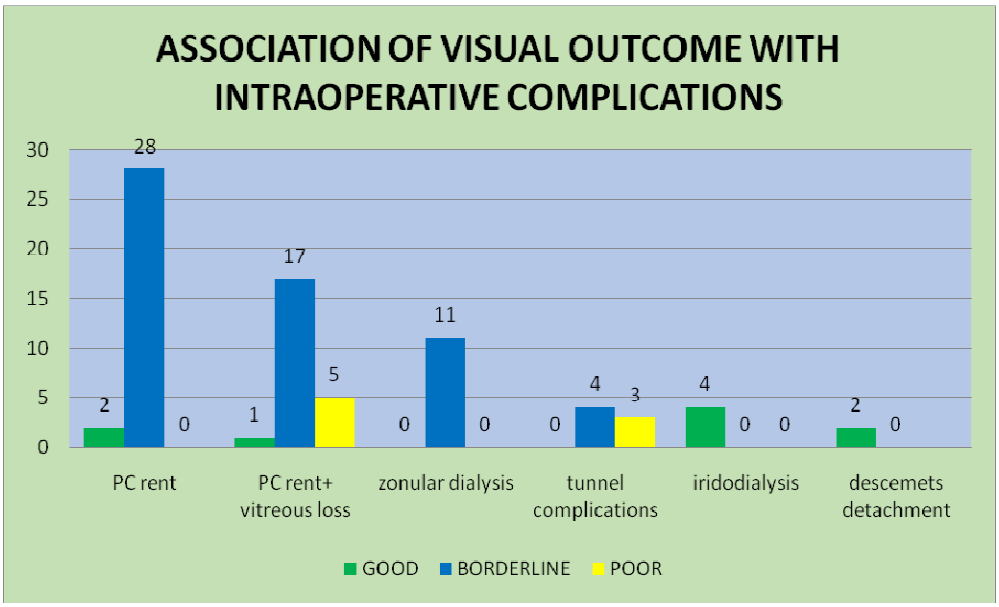
Cataract	Intraoperative complications						
	Pc rent	Pc rent + vitreous loss	Zonular dialysis	Tunnel complications	Irido-dialysis	Descemets detachment	Total
Nuclear sclerosis	23	17	0	1	0	0	41
Cortical	0	0	0	2	0	0	2
Mature	6	4	7	0	0	0	17
Hypermature	1	2	4	0	0	0	7
Posterior subcapsular	0	0	0	2	2	1	5
Posterior Polar	0	0	0	2	2	1	5
Total	30	23	11	7	4	2	77



- All 7 Hypermature cataracts were associated intraoperative complications.
- Nuclear sclerosis is significantly associated with PC rent with or without vitreous loss.

Table 12: Association of visual outcome & intraoperative complications

Visual outcome	INTRAOPERATIVE COMPLICATIONS						
	PC Rent	PC Rent +Vitreous Loss	Zonular Dialysis	Tunnel complications	Irido-dyalisis	Desemets Detachmtnt	Total
Good	2	1	0	0	4	2	9
Borderline	28	17	11	4	0	0	60
Poor	0	5	0	3	0	0	8
Total	30	23	11	7	4	2	77



- PC rent with or without vitreous loss & zonular dialysis are largely associated with borderline outcome.
- Vitreous loss & tunnel complications are largely associated with poor visual outcome

Discussion

Cataract blindness is the main target of National Program for Control of Blindness in India and most of the resources are diverted for the elimination of the same. A lot of emphasis is laid upon increasing the coverage of cataract surgery. It includes organization of eye camp surgeries by government and non-government organizations. Considering the immense load of cataract blindness and limited resources it is not unlikely that the qualitative aspect could sometimes be ignored. This is particularly true while considering the community at large. With increase in awareness of the quality of life in general and quality of eye care in particular various reports have been published regarding the poor outcome of cataract surgery at the community level in India

- 824 cases of manual small incision cataract surgery were studied for visual outcome at tertiary care hospital. Patients were selected carefully for the study & those with co-morbid ocular disease; which can affect final visual outcome were excluded. Follow up patients done 1st, 4th& 8th week and those factors responsible for low visual outcome at 8th week; were tried to be identified.
- As shown in table 5.1, Females constitutes the majority, 445 (54%) as compared to males in the present study.Table 5.2 shows that, out of 824 cases, patients in the 61 to 70 years age group were maximum accounting for 432 (52.43%) cases;similar to study of MadhuChanchlani et al wherein maximum i.e. 43.7% of patients were in the same age group. In our study, seventeen patients were above 80 years. Mean age group being 64.9 years.
- Table 5.3 shows that, in our study, cataract was nuclear sclerosis type in 286 (34.7%), mature cataract 195 (23.68%), posterior subcapsular 177 (21.48%), cortical 121 (14.68%), posterior polar 38 (4.61%), hypermature 7 (0.84%) of cases. Our study compares well with the studies of Vashistet al[53] wherein he found that nuclear sclerosis is most common type of senile cataract accounting for 48% in North India & 38% in South India. Murthy GV et al[54] in his study also find that nuclear opacities are most common type 56.9%.
- As per Table 5.4, Preoperative visual acuity of less than 3/60 was seen in 479 (58.13%) of cases. It can be explained by the fact that maximum patients visiting tertiary care hospital come from low socioeconomic strata who earn by daily wages. So, they tend to present themselves at the last moment, when they cannot work anymore with their low vision. In the present study only 38 (4.61%) cases fitted in the group having pre operative visual acuity >6/60. Yorston D et al. in his study compared pre operative visual acuity with that of a study in United Kingdom. In the latter group 30% of the eyes undergoing surgery had vision of 6/18 or better, but in his study he reported only 0.5 % of eyes operated had this level of visual acuity. Our study goes well with the study conducted by Yorston D. Majority of the patients in this study belonged to rural areas.
- As shown in Table 5.5, manual small incision cataract surgery with clear corneal incision (58.61%) was the most common technique of cataract surgery. But, the final visual outcome is assessed irrespective of type of surgery done as this study doesn't aim to compare various procedures and styles used by different ophthalmologists.

- Out of 824 patients, 43 (5.21%) patients were lost to follow up. Table 5.6 shows that, out of remaining 781 patients, 675 (86.42%) had good visual outcome. MadhuChanchlani et al reported good outcome in 89.42%, Chirambo MC in 75.1%, Yorston D in more than 80% cases, Gogate PM in 89.8% &Oladigbolu KK in 87.1% patients. Our study corresponds well with other studies as well as fairly meets guidelines given by WHO.
- Data of all 106 patients with borderline & poor outcome was studied & according to Table 5.7, intraoperative complications 68 (8.7%) were the major cause responsible for low visual outcome.
- In Table 5.8, data of total 781 patients is analyzed and it is found that 9 patients with some intraoperative complications had good outcome. So intraoperative complications occurred in total 77 (9.8%) patients & are responsible for low visual outcome in 68 (8.7%) patients
- Chirambo MC et al in their study found that intraoperative complications occurred in 10.4% patients, Yorston D et al in 12.66%, Gogate PM et al in 8.1% and Oladigbolu KK et al reported 10.1% incidence of intraoperative complications. The rate of intraoperative complications of 9.8% in our study corresponds well with other studies and is also under the maximum limit of 10% as per guidelines given by WHO
- In Table 5.9, intraoperative complications are analyzed& it is found that posterior capsule rent occurred in 30 (3.64%) patient is the most common intraoperative complication followed by posterior capsule rent with vitreous loss 23 (2.94%).
- Incidences of posterior copsule rent reported by various authors are: 3.77% by Gogate PM et al, 6.3% by Yorston D et al, 2.9% by Oladigbolu KK et al, 5.4% by Lumme P[55] et al and 4.5 % by Schroeder B[56] et al.
- Incidences of posterior capsule rent with vitreous loss are 1.6% by Gogate PM et al and 5.1% by Yorston D et al.
- In our study, rate of both complications is well below the maximum limit of 5% as per guidelines given by WHO & corresponds well with other studies.
- Gogate PM in his study had reported increased incidence of posterior capsule rent in hypermature and hard cataract where the posterior capsule is thinned out or there is very less cortex between the nucleus and the capsule. In the present study; posterior capsule rent occurred in 50 cases of hard nuclear cataract while prolapsing nucleus in anterior chamber & 3 cases of hypermature cataract at the time of irrigation aspiration. Out of 53, 13 patients managed with sulcus fixated IOL and remaining 40 with PCIOL.
- .Zonular dialysis seen in 11(1.4%) patients. 7 cases were elderly patients all above 85 years of age with mature cataract & 4 patient had hypermature cataract. All cases had dialysis less than 90 degree & could be managed with sulcus fixated IOL. The causes of zonular dialysis include a traumatic capsulectomy, excessive maneuvering of the nucleus, or aspiration of either the anterior, equatorial, or posterior capsule with the irrigation–aspiration tip. Lumme P et al reported incidence of zonular dialysis of 6.6%, Schroeder B et al of 1.6% and Yorston D of 0.9%. This shows that our study corresponds well with other studies.
- Tunnel complications occurred in 7 (0.88%) patients. 3 cases had premature entry and 4 cases had irregular anteriorly displaced tunnel. Where needed; sutures taken with 10-0 nylon at the end of

surgery. Schroeder B et al reported tunnel complications in 1.5% of cases.

- Iridodialysis was seen in 4 (0.51%) case which were 1 clock hour in extent, and did not have any significance in the final visual outcome. This complication occurred during manipulation of hard cataract in the anterior chamber. Schroeder B &Gogate PM reported incidence of iridodialysis of 0.7% & 0.3 respectively in their study.
- Descemet's detachment was seen in 2 (0.25%) cases in the present study. Schroeder reported Descemet's detachment in 0.7% of cases. In our study Descemet's detachment occurred probably due to faulty instrumentation. Detachment was small in both cases and placement of air bubble facilitated its opposition.
- In our study, Retained lens cortex was observed in 51 patients on 1st postoperative day. In 14 cases, it got reabsorbed well & was responsible for low vision in 37 (4.8%) patients at 8 weeks. They are mostly observed in hard nucleus with miotic pupil & difficult visualization and in some cases of weakened zonules of very elderly patients. Schroeder found retained lens cortex in 3% patients in his study and Oladigbolu KK reported 4.2% which nearly corresponds with our study.
- One very elderly patient who was under psychiatry treatment landed up in PL –ve vision as he vigorously rubbed his eye on immediate postoperative day so that his IOL protruded out tearing his cornea apart!! His corneal tear was repaired immediately. But, vision remained PL –veonly. This is rarest of rare incidence and emphasizes the need of continuous monitoring of patients who are very elderly or on psychiatry treatment.
- Other early postoperative complications like striate keratopathy, iritis, hyphema and raised intraocular pressure were managed successfully and didn't affect final visual outcome in any way and hence not discussed here.
- Limitation of this study is incomplete follow-up. i.e. less than 95% - which could easily give rise to large bias resulting in gross underestimates of poor outcome after surgery. Patients should be counseled adequately to follow up at prescribed intervals. Uncorrected refractive errors are often blamed as failure of cataract surgery and dissatisfaction among patients & it also can result into less patients showing up for getting operated. Short duration of study is another limitation of this study.
- This study shows that after good selection of patients; a cataract surgery by skilled & experience hands and with postoperative correction of refractive error; good visual outcome can be achieved in more than 85% patients at a set up like tertiary care hospital. It still falls short of guidelines of WHO which demands more than 90% patients with good visual outcome. In our set up, scope of improvement lies in reduction in incidence of intraoperative complication. Rather; a good management of complications with good quality of instruments & operating microscope, availability of modern enmities like vitrectomy machines, capsular tension rings can definitely improve visual outcome & will go a long way in improving both quality & quantity of surgery.

Summary and Conclusions

Summary

1. This prospective study was conducted at tertiary care hospital. 824 patients were included in this study.
2. Majority of the patients were in 61-70 years age group, who accounted for 432 (52.43%) cases. The average age of presentation was 68.4 years.

3. Sex distribution showed preponderance of females 445 (54%) in the study.
4. Majority of the patients had Nuclear sclerosis type of cataract 286 (34.7%) followed by mature cataract in 195 (23.68%) of cases.
5. Out of 824, only 781(94.75%) patients came for follow up at 8 weeks.
6. Out of 781 patients, Good visual outcome obtained in 675 (86.42%), borderline in 91 (11.65%) & poor outcome was present in 15 (1.92%) patients.
7. Data of patients with borderline & poor outcome was analyzed and it is found that intraoperative complications 68 (8.7%) followed by retained lens material 37 (4.8%) were major causes..
8. Intraoperative complications were PCrent in 30 (3.64%), PC rent with vitreous loss 23 (2.94%), zonular dialysis 11(1.4%), tunnel complications 7 (0.88%), iridodialysis 4 (0.51%) and descemets detachment in 2 (0.25%) patients.
9. Retained lens cortex was present in 37 (4.8%) patients & was encountered in hard cataracts with miotic pupil. No other early postoperative complication was seen to affect visual outcome at 8 weeks.
10. Intraoperative complications are the important causes of low visual outcome.
11. Incidence of intraoperative complications can be reduced by use of good quality of instruments and modern amenities.
12. Such routine monitoring of visual outcome of cataract surgery to understand causes of poor outcome is the first step in improving quality of surgery at any institution.

Conclusions

1. Despite the modern technology has done to advance the treatment of cataracts, the greatest challenge in our field continues to be large and increasing backlog of cataract blindness in developing countries.
2. Manual Small Incision Cataract Surgery has now come to be established surgical procedure for cataract surgery in developing countries like India.
3. Visual outcome of cataract surgery at our tertiary care hospital fairly meets the guidelines given by WHO.
4. Intraoperative complications followed by retained lens material are important causes of low visual outcome at our hospital.
5. This study shows that scope of improvement in visual outcome at our hospital lies in reducing incidence of intraoperative & postoperative complications and management of them with good quality of instruments & modern techniques
6. The complications managed with standard surgical techniques are surely compatible with good visual outcome
7. Prospective standardized monitoring of cataract surgical outcomes with regular analysis of the causes of poor outcome is an important tool, which individual ophthalmic surgical teams can use to improve the results of their cataract surgery.
8. The emphasis should be on continuous internal audit over time in order to improve results, rather than on inappropriate comparison of results between canters or surgeons.
9. Routine monitoring of visual outcome of cataract surgery at every hospital will go in long way to improve both quantity & quality of surgery and thus reduce the substantial amount of burden of blindness on our country.

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