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Original Research Paper

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A COMPARISION OF POSTERIOR CAPSULAR OPACITY FORMATION UPTO 1 YEAR IN PATIENTS WITH SMALL INCISION CATARACT SURGERY WITH FOLDABLE INTRAOCULAR LENS AND PHACOEMULSIFICATION WITH THE SAME INTRAOCULAR LENS

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ABSTRACT

Introduction: Cataract is most common cause of curable blindness worldwide and cataract surgery is most common procedure performed in ophthalmology. Posterior capsular opacification (PCO) is most common complication after cataract surgery which is usually treated with Neodymium-doped: Yttrium Garnet (Nd:YAG) laser posterior capsulotomy or occasionally with a surgical capsulotomy. The incidence and severity of PCO correlates to the type of surgical technique, IOL optic edge designs and IOL materials.

Material And Methods: 70 eyes of 64 patients operated for age related cataract were studied in this prospective interventional study. Phacoemulsification was done in 35 eyes and SICS in 35 eyes with hydrophobic single piece biconvex foldable intraocular lens. Patients were followed up at 1, 3, 6, 9 and 12 months for the development of PCO. Clinically significant PCO (loss of 2 or more lines of Snellen's visual acuity chart) was treated with Nd:YAG laser capsulotomy.

Results: The overall incidence of PCO was 22.85%. Amongst the patients who developed PCO, SICS and phacoemulsification was performed in 62.5% and 37.5% patients respectively. Result was statistically significant with p value <0.05 using z test. On first postoperative day, patients operated with phacoemulsification had better visual acuity than SICS.

Conclusion: Phacoemulsification can provide early and better visual outcome than SICS and has lower incidence of PCO formation which may be due to difference in irrigation and aspiration and less disruption of blood aqueous barrier than SICS. PCO can be reduced by atraumatic surgery and thorough cortical clean up and capsular polishing.

KEYWORDS : Posterior capsular opacification, Small incision cataract surgery, Phacoemulsification, Comparison of techniques of cataract surgery

INTRODUCTION

Cataract is the most common cause of curable blindness worldwide. Cataract surgery is the most common surgical procedure performed with high success rate in ophthalmology. [1] Phacoemulsification has taken front seat in the available modalities for cataract surgery but Small Incision Cataract surgery (SICS) is a good alternative where phacoemulsification machine is not available.

Posterior capsule opacification (PCO) (after cataract or secondary cataract) is one of the most common complications after cataract surgery [2, 3] and a major cause of diminution of vision after an uneventful cataract surgery. Based on various studies, it may happen in 20% of the cases within a year after cataract surgery. Its incidence has been reported to reach as high as 50% within first five years of surgery. [4, 5] The PCO response is a consequence of proliferation, migration, and trans-differentiation of lens epithelial cells (LECs) that are normally situated in a single layer on the inner side of the anterior lens capsule. The incidence and severity of PCO correlates with different surgical techniques, IOL optic edge designs and IOL material [6].

PCO involving the central visual axis is usually treated with a Neodymium-doped: Yttrium Aluminium Garnet (Nd: YAG) laser capsulotomy of the posterior lens capsule and occasionally with a surgical posterior capsulotomy. These treatments result in an opening in the central posterior lens capsule, providing a clear visual axis. It carries small risk of damage to IOL, raised intraocular pressure, cystoid macular oedema or retinal detachment [7]. With modern surgical techniques and IOL designs, the expected rate of PCO and subsequently Nd: YAG laser posterior capsulotomy (Nd: YAG Capsulotomy) is decreasing to less than 10%. [1,8]

In this study we have compared the rate of PCO and the need for capsulotomy in patients operated for cataract with two different type of surgical techniques that is phacoemulsification and small incision cataract surgery(SICS) with same type of intraocular lens(IOL) to avoid IOL related confounding factors. We have also assessed which cataract extraction surgery provides earlier and better visual outcome.

MATERIALS AND METHODS:

Ethical measures were adhered to throughout all phases of the research. The study was conducted among patients above the age of 40 years, attending our tertiary healthcare referral centre, who had age related senile cataract and were operated with phacoemulsification or SICS with hydrophobic single piece biconvex foldable intraocular lens. The duration of the study was 1.5 years. Patients with any other type of cataract, patients with primary PCO, patients in whom cataract surgery is difficult due to media opacity such as corneal opacity, any associated ocular pathology such as glaucoma, any history of ocular surgery, any systemic illness such as diabetes and hypertension and patients not willing to participate in the study were excluded. If any of the patients initially enrolled in our study had intra or post-operative complications, they were excluded from the study analysis.

Ours is a prospective interventional study with sample size of 70 eyes of 64 patients. Informed consent was obtained from all the respondents before enrolling in the study.

Following thorough history, all the patients underwent detailed anterior and posterior segment examination with ancillary investigations such as B- scan ultrasonography before surgery. Ocular examination comprised of best corrected visual acuity (BCVA), slit lamp examination

including intraocular pressure (IOP) followed by posterior segment examination with help of slit lamp biomicroscopy using 90 dioptre lens and indirect ophthalmoscopy. We uniformly used combination eye drop having tropicamide 0.8% w/v with phenylephrine 5% w/v for fundus examination. All the routine battery of investigations including serology was performed in all patients before surgery.

Phacoemulsification was done in 35 eyes and small incision cataract surgery (SICS) was done in rest 35 eyes with implantation of hydrophobic single piece biconvex foldable intraocular lens. All the surgeries were performed by single skilled surgeon under local anaesthesia to avoid operative bias.

In patients, operated with SICS, a sclero-corneal tunnel around 1.5-2.0 mm away from superior limbus, 5.0- 6.5 mm in length according to size of the nucleus and 3-4 mm in width was made after making fornix based conjunctival flap. Rest of the steps were as per standard SICS technique. In patients operated with phacoemulsification, 2.8mm corneal tunnel was made with the help of keratome superiorly. Here nucleus was removed with the help of phacoemulsification(ultrasonic energy) using stop and chop or divide and conquer method. Rest of the steps were as per standard phacoemulsification technique.

Patients' follow ups were done at 1 month, 3 months, 6 months, 9 months and 12 months for the development PCO and in between if they develop any complaint of visual deterioration. We repeated clinical examination including posterior segment examination in the same uniform manner by same examiner on each follow up for all patients.

Clinically significant PCO was labeled if BCVA deteriorated 2 or more lines on Snellen's chart and based on capsular opacification on SLE. This eyes were treated with Nd:YAG laser capsulotomy and complications were noted if any. After capsulotomy patients were advised antibiotic and steroid combination eye-drops with anti-glaucoma eye-drops for one week. After 1 week patient was prescribed appropriate subjective correction. We have followed Sellman and Lindstrom grades of PCO for its classification throughout our study.

The data was entered into Microsoft Excel sheet for further statistical analysis. P values were calculated from 'z'- test wherever applicable.

RESULTS

The study included 70 eyes of 64 patients out of which 29 (45.31%) were males and rest 35 (54.68%) were females.

Age group included was 40 years onward. Maximum 33(51.56%) patients were in the age group of 61-70 year.

The overall incidence of PCO was 22.85% as 16 out of 70 eyes developed visually significant PCO and needed Nd:YAG capsulotomy. Elschning pearls type of PCO was invariably seen alone or as a combination with fibrous type in eyes that developed PCO. PCO was found more in males than females. From 16 patients who developed PCO, 6 (37.50%) patients were females and 10 (62.50%) were males. In 16 patients who developed PCO, 10 (62.5%) were operated with SICS and 6 (37.5%) with phacoemulsification. PCO was found more in SICS as compared to phacoemulsification and the result was statistically significant with p value <0.05 using z test (z test, p is < 0.00001). (Chart 1)

All patients who developed PCO were treated with Nd:YAG capsulotomy and amongst them 12.5% developed cystoids macular edema (CME) ,diagnosed on optical coherence tomography (OCT). They were treated with topical nonsteroidal anti-inflammatory drugs and were resolved without any sequel.

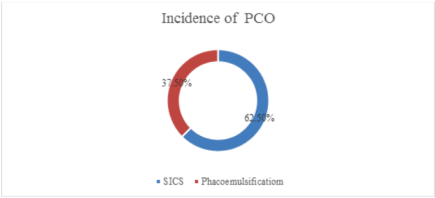

Chart 1: Comparison Of Incidence Of PCO In SICS And Phacoemulsification

On first postoperative day 26 (74.28%) patients operated with phacoemulsification had uncorrected visual acuity (UCVA) of >6/12. By the end of 3 months all of them were having BCVA of >6/12. The rate of PCO was 17.14% in patients operated with phacoemulsification. The development of visually significant PCO was found at minimum duration of 9 months postoperatively in 50%. (Table 1)

Table 1: Analysis Of Patients Operated With Phacoemulsification

Follow Up	Visual acuity	No of eyes	PCO present (no of eyes)	No of Nd:Yag PCOtomy
POD-1	< 6/60	0		
(UCVA)	6/60 to 6/18	9	Nil	Nil
	6/12 to 6/6	26		
1 month	< 6/60	0		
(UCVA)	6/60 to 6/18	1	Nil	Nil
	6/12 to 6/6	34		
3 month	< 6/60	0		
(BCVA)	6/60 to 6/18	0	Nil	Nil
	6/12 to 6/6	35		
6 month	< 6/60	0		
(BCVA)	6/60 to 6/18	0	Nil	Nil
	6/12 to 6/6	35		
9 month	< 6/60	0		
(BCVA)	6/60 to 6/18	3	2	2
	6/12 to 6/6	32	1	1
12 month	< 6/60	0		
(BCVA)	6/60 to 6/18	2	2	2
	6/12 to 6/6	33	1	1

In patients operated with SICS, on first postoperative day 32 patients were having UCVA between 6/60-6/18 and 3 patients >6/12. At the end of 3 months they all have BCVA of >6/12. In SICS, the rate of PCO was 28.57%. The rate of development of visually significant PCO was 20% at 6 months. (Table 2)

Table 2: Analysis Of Patients Operated With SICS:

Follow Up	Visual acuity	No of eyes	PCO present (no of eyes)	No of Nd:Yag PCOtomy done
POD-1	< 6/60	0		
(UCVA)	6/60 to 6/18	32	Nil	Nil
	6/12 to 6/6	3		
1 month	< 6/60	0		
(UCVA)	6/60 to 6/18	17	Nil	Nil
	6/12 to 6/6	18		
3 month	< 6/60	0		
(BCVA)	6/60 to 6/18	0	Nil	Nil
	6/12 to 6/6	35		
6 month	< 6/60	0		
(BCVA)	6/60 to 6/18	2	2	2
	6/12 to 6/6	33		
9 month	< 6/60	0		
(BCVA)	6/60 to 6/18	5	5	5
	6/12 to 6/6	30		

12 month	< 6/60	0		
(BCVA)	6/60 to 6/18	2	2	2
	6/12 to 6/6	33	1	1

DISCUSSION

Decreasing the rate of PCO following cataract surgery is important as laser capsulotomy is associated with significant complications and access to Nd:YAG capsulotomy machine is not widely available in developing countries especially in semi-urban and rural settings. Our goal was to evaluate if surgical technique can affect the development of PCO or not. IOL related factors were eliminated by using same type of IOL in both the surgical techniques. With that the postoperative visual outcome of both the techniques was also noted.

In our study 70 eyes of 64 patients were examined over a period of one year who were operated for cataract surgery with either phacoemulsification or SICS for the development of PCO. PCO was developed in 16 (22.85%) patients, 10 (62.50%) patients were operated with SICS and 6 (22.85%) with phacoemulsification. Rate of PCO was found more in SICS which was statistically significant $p<0.05$. All patients who developed PCO undergone Nd:YAG capsulotomy. 12.5% of them developed CME as complication of capsulotomy. Amongst the patients who developed PCO, 62.5% were males and 37.5% were females.

A study done by Anand et al on 200 eyes with decreased visual acuity due to PCO showed that onset of PCO was early in SICS as compared to phacoemulsification. PCO was found more in hydrophilic IOLs and the most predominant type of PCO was Elschnig pearls. [9] These findings are comparable to our study as the development of PCO was early and more in SICS group as compared to phacoemulsification and all patients who developed PCO had Elschnig pearls type of PCO either alone or in combination with fibrous type.

In SICS, the cortical matter is removed by manual Irrigation and aspiration using Simcoe's two way cannula while in phacoemulsification it is done using automated Irrigation and aspiration. This might explain the early onset of PCO in SICS as compared to phacoemulsification.

Apple et al observed that thorough cortical cleanup minimizes the number of retained lens epithelial cells and cortex within the capsular bag and avoids or delays the formation of PCO. [6] A study done in Nepal by Ruit et al in 2005, vision on first postoperative day was better in manual SICS which was correlated with greater increase in corneal thickness in phacoemulsification group. This increased corneal thickness was due to advanced nuclear cataracts in their patient population. Visual outcome was found better in phacoemulsification at 6 months postoperatively and most likely explanation for that was the greater incidence of PCO in manual SICS group. [10]

In another study done for assessment of the development of PCO, the incidence of PCO was found 14.2%. In their study, 74.7%, 10.6% and 14.7% patients were operated with phacoemulsification, SICS and ECCE respectively. The incidence of PCO increased with time from 10.9% at one year to 22.7% at 4 years. [11] This is less than our study results; this may be due to large sample size of that study, different study design and unequitable distribution of surgical technique. They also concluded that incidence of PCO was more in SICS than phacoemulsification which is comparable to our study.

George et al in 2005 compared surgically induced astigmatism and endothelial loss following conventional ECCE, SICS and phacoemulsification with non-foldable intraocular lens implant in 186 eyes with nuclear sclerosis of grade 3 or less. They found that less astigmatism was induced by Phacoemulsification than SICS and ECCE which explained the better visual outcome after phacoemulsification. [12]

In our study, we found that on first postoperative day patients operated with phacoemulsification had better UCVA than SICS which is comparable with the study done by Gogate et al in 2005 which compared the efficacy, safety, and astigmatic change after cataract surgery by phacoemulsification and MSICS via a randomized control trial. Gogate et al (2005) concluded that both phacoemulsification and SICS are safe and effective for visual rehabilitation of cataract patients but phacoemulsification gives better UCVA in a larger proportion of patients at 6 weeks postoperatively. [13]So, the better uncorrected visual outcome after phacoemulsification can be due to smaller incision size which results into postoperative lower astigmatism.

In a study done by Bilal Khan et al on complications of Nd:YAG laser capsulotomy, IOL pitting was the most common complication (12.8%) followed by transient rise in IOP (Intra Ocular Pressure) in 8.69% and CME in 3.89%.[14] In our study rise of IOP was managed by post capsulotomy IOP lowering drops. CME was found in 12.5% cases. No patient had IOL pitting. Minimum energy level combined with minimum number of precisely focused shots can reduce the risk of complications after laser capsulotomy.

Advancement in surgical technique and improvement in IOL design have greatly reduced the incident of PCO.

CONCLUSION

Posterior capsular opacification is the most common complication after extra capsular cataract extraction. From our study, we have found that Phacoemulsification has low incidence of PCO formation as compared to SICS which may be due to difference in irrigation and aspiration and more disruption of blood aqueous barrier in SICS. Patients with visually significant PCO are treated with Nd:YAG laser capsulotomy which has its own complications. So, this opacification may be reduced by atraumatic surgery and thorough cortical clean up with capsular polishing. Phacoemulsification can provide early and better visual outcome than SICS.

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