Effect of Anterior Capsular Polishing on the Incidence of YAG Capsulotomy

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Purpose: To study the effect of anterior capsule polishing during phacoemulsification on the incidence of post operative YAG laser capsulotomy. **Method:** A retrospective controlled study of 159 patients who underwent uncomplicated phacoemulsification with anterior capsular polishing between October 1998 and March 2000. 169 age matched patients who underwent phacoemulsification but without anterior capsule polishing served as controls. Main outcome measure: Incidence of visually significant YAG capsulotomy, which improved the Snellen acuity for more than 1 line or at least 1 line with subjective improvements in symptoms. **Results:** 2.51% of patients with anterior capsular polishing (Group1) had YAG capsulotomy compared to 7.1% of patients in control group at one year. However, after two years, 11.3% of patients in Group 1 had YAG capsulotomy compared to 12.4% in Group 2. **Conclusion:** Anterior capsular polishing during cataract surgery may delay the opacification of posterior capsule during the early postoperative period. But does not decrease the incidence of YAG capsulotomy after two years.

Key words: Anterior Capsular Polishing, YAG Capsulotomy

Posterior capsule opacification (PCO) continues to be a major complication of modern cataract surgery with intraocular lens (IOL) implantation. A1998 meta analysis[1] found that visually significant PCO develops in 11.8% of patients by 1 year after cataract extraction with posterior chamber IOL (PC IOL) implantation, rising to 28.4% at 5 years postoperatively. Although Nd: YAG laser capsulotomy is safe and effective in restoring lost visual acuity but is not always without complication. An increase intra ocular pressure[2], cystoid macular edema[3], retinal detachment [(4)] and associated damage to IOL[5] are the most frequently seen complications.

Posterior capsule opacification develops from residual lens epithelial cells (LECs) that undergo proliferation, migration, metaplasia, and opacification in the capsular bag after cataract extraction. In the peripheral capsular bag these processes cause no symptoms, but when they encroach the visual axis they produce light scatter and visual deterioration.

Various techniques and strategies used to reduce the incidence of PCO fall into three broad categories: 1) IOL design and material, 2) surgical techniques and 3) drugs /toxins to destroy LECs. Apart from drugs which are still in experimental stages, it is now clear that IOL design[6,7] and material [(8)] play an important part in prevention of PCO. Modifications in the surgical technique, like size of CCC[9], in bag IOL implant[10] and thorough cortex cleaning [(11)] have also been demonstrated of some benefit. However polishing the posterior capsule at operation has been found to be of no advantage[12].

Complete removal of LECs should eliminate the opacification of posterior capsule; however some LECs are retained invariably in the capsular bag periphery[13].
Polishing of anterior capsule is known to decrease the postoperative incidence of anterior capsular fibrosis[14,21]. In 1991 Nishi[15] showed that thorough cortical cleanup and LECs removal by anterior capsular polishing decreases the incidence of PCO in intercapsular cataract extraction. However there appears to be a paucity of literature regards the efficacy of anterior capsular polishing in reducing the posterior capsular opacification in patients undergoing phacoemulsification. A study was therefore performed to assess the impact of polishing of the anterior capsule on the incidence of YAG capsulotomy.

Methods:
Records of all the patients who underwent cataract operation performed by two surgeons (S.K.H) & (M.N.K), between October 1998 and March 2000 were reviewed retrospectively.

All the cases that had a six monthly follow up for at least 2 years due to any ophthalmic condition were selected. Patients with presenile or secondary cataract, any operative or postoperative complication; best corrective visual acuity (BCVA) of less than 6/18 after the operation, history of uveitis and/or previous history of intra ocular surgery were excluded from the study.

Group I comprised of patients who had a standard phacoemulsification with anterior capsular polishing and in bag IOL implant performed by a single surgeon (S.K.H). A superior corneal tunnel incision was made, and the anterior chamber was reformed with sodium hyaluronate 1% (Healon). A CCC between 5.0 and 6.0 mm was created with a cystotome. Hydro dissection and hydro delineation of the lens was performed with Balance Salt Solution. The nucleus was removed by the divide and conquers technique and soft lens material, by irrigation/aspiration (I/A). Then anterior capsule was then polished with I/A tip which was set at 25cc/min flow and 140mm Hg vacuum. All effort was made to reach as far to the periphery as possible. After that the bag was filled again with visco elastic and a folded Hydroview IOL

(Storz H 60M) was implanted in the bag. All the patients received standard treatment of dexamethasone 0.1% for I month and chloremphenicol 0.5% for 1 week.

The control (Group II) comprised of patients who had phaco-emulsification with in bag IOL performed by another surgeon (M.N.K) during the same time period using the same IOL and operation technique but no attempt was made to polish the anterior capsule. The inclusion and exclusion criteria were similar to group I.

Both the groups were followed every 6 monthly for 2 years. The main outcome measure was YAG capsulotomy, which improved the visual acuity (VA) for more than 1 line or at least 1 line with subjective improvement in symptoms. At each visit BCVA, co morbidity, presence of posterior capsular opacification (PCO), type of PCO, indication of YAG capsulotomy, date of YAG capsulotomy, amount of energy used during YAG and number of lines improved on Snellen chart after YAG capsulotomy were recorded. The YAG capsulotomy was considered clinically significant if it improved the VA by more than 1 line on Snellen chart or at least 1 line with subjective improvement in symptoms.

The two groups were compared for rate of YAG capsulotomy and mean time interval between the surgery and YAG capsulotomy. All statistical analyses were performed with the Statistical Package for the Social Sciences (SPSS-PC). $X^{2\ test}$ was used for categorical variables and t test was used for continuous variables. Level of statistical significance was set at P<. 05.

Results:

In Group 1, 468 patients underwent cataract surgery during October1998 to March 2000, out of which 159 patients fulfilled the inclusion criteria. Group 2 comprised of 169 cases. The demographic details and general features of the two groups are shown in Table 1

There was no significant difference in age and sex distribution between the two groups. The co existing pathologies in the two groups were also comparable. All these patients attended the eye clinic for two years

The detailed results are shown in table 2 & 3.

None of the patient in group I needed YAG capsulotomy in the first six months, where as 3.5% patients in group II had clinical significant YAG capsulotomy. 2.5% patients in-group I had YAG capsulotomy as compared to 7.1% in-group II at one year. After 18 months, 6.9% in-group I had YAG capsulotomy as compared to 10.1% in-group II. Therefore, by two years 11.3% patients in-group I and 12.4% in-group II had clinical significant YAG capsulotomy.

The mean time interval between the surgery and YAG capsulotomy in Group I was 19±4.71 months as compared to 14±6.66 months in Group II (P value 0.005). The reason of this statistically significant difference is that none of the patients' in-group 1 had YAG capsulotomy within 6 months as compared to 6 in-group 2. The mean improvement in VA on Snellen chart was about the same between the two groups

Table 1

	Group I	Group 12
No. of Patients	159	169
Age range (mean±SD)	61-94 (76.98 ±7.92)	62-93 (77.6±8.14)
Male: Female	1:1.41	1:1.73
BCVA after cataract surgery (Mean)	6/5-6/18(6/8)	6/5-6/18 (6/6.3)

Reason of follow up

Table 2: Demographic details of the patients included in the study

POAG	34	48
OHT	11	09
Glaucoma Suspect/Disc anomalies	09	12
Diabetic Retinopathy	35	23
Peripheral fundus Lesion	11	09
Macular Lesions	06	15
Cataract in Other Eye	18	17
Re Referral due to PCO	17	28
Oculoplastic	12	07
No Reason?	06	01

(POAG: Primary open angle glaucoma, OHT: Ocular hypertension)

Table 3: Incidence of posterior casular opacification in the two groups

Time for surgery noted	Group I (n=159)			Group I (n=169)		
	PCO done	YAG	Significant noted	PCO done	YAG	Significant noted
6 Months	03	0	0	10	06	06
1 Year	07	04	04	18	13	12
18 Months	15	12	11	24	19	17
2 Years	23	19	18	28	23	21

Table 4: Summary of the results

	Group I	Group 2	p-value
Rate of YAG capsulotomy after 1 year	2.51%	7.1%	0.05
Rate of YAG Capsulotomy after 2 years	11.3%	12.4%	0.756
Mean Time interval between surgery and YAG (months)	19±4.71	14±6.66	0.005
Mean Improvement in Snellen Acuity (lines)	2.5±0.71	2.85±0.8	0.15

In summary, the incidence of YAG capsulotomy in Group 1 was 2.51% as compared to 7.1% in Group 2 at one year (p value 0.05). However, after 2 years the Incidence in-group 1 rose to 11.3% and that of group 2 was 12.4% (p value 0.756). (Table 4)

The posterior capsular opacification trends in the two groups are depicted in figure 1.

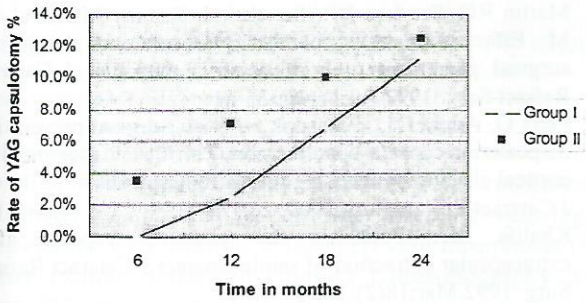

Fig. 1 Trends of posterior capsular opacification in the two groups

Discussion:

PCO one of the important squeal of cataract extraction has medical, social and economical adverse effects. Therefore techniques that alter the incidence of PCO have not only medical but also social and economical implications.

PCO has been attributed to the proliferation and migration of residual LECs there fore any attempt to completely removes these LECs or prevent them from approaching the visual axis will reduce the incidence of PCO.

Retained lens epithelial cells are of two types[11] E cells which are highly mitotic cells from the equatorial lens, and have a potential to grow across the visual axis and cause PCO, especially the Elschnig's pearls. The other type is cuboidal cells of the anterior capsule i.e. A cells. These cells are also involved in PCO formation[14] but their role is not clear. However A cells have been shown to be involved in anterior and posterior capsular fibrosis [13][14] [16] and LEC layer formation on anterior IOL surface. [17] These A cells near capsular edge show high degree of growth and activity, presumably due to lack of contact inhibition[18] and grow toward posterior capsule[19]. LECs beneath anterior capsule can be removed effectively by ultrasound and aspiration, [20] [21] but while performing anterior capsular polishing it is almost impossible to remove every single cell because of approach of the polishing instrument and the visualization of anterior capsule and equator[21,22].

The aim of the anterior capsular polishing in the present study was to get rid of the A and E cells as much as possible, and evaluate its impact on the incidence of PCO and hence YAG capsulotomy.

Like any other retrospective study, adequate follow up was a problem thus limiting the number of subjects, which could be included into the study and control groups. The fact that most of uneventful phacoemulsification patients are discharged in the early post operative period and only patients with ocular co morbidity are usually followed up in the clinics accounts for the high number of patients with diabetes and glaucoma as compared to normal population in our study. However all the variables involved in the modulation of PCO in both groups were similar like age of patient, type of implant, technique of surgery apart from anterior capsular polishing.

Because of inter observer variation regarding grading of PCO which in itself at times has been reported to be misleading [16], the intervention in the form of YAG capsulotomy was taken as a measure to indicate absence or presence of PCO. Since the capsulotomy itself fails to distinguish the degree of PCO, (as indication for capsulotomy were not standardized and patients were seen by different ophthalmologists), we used the increase in lines on Snellen chart as a proxy measure of degree of PCO. Subjects in which YAG capsulotomy did not improve the visual acuity or the symptoms were not taken into consideration while measuring the incidence.

Analysis of the results shows that the improvement in VA was comparable in both groups. These results show that anterior capsular polishing had no effect on the amount and degree of PCO. With regards to the actual incidence of PCO in two groups there appears to be a delay in appearance of PCO in the group wherein anterior capsular polishing was performed. This can be attributed to a decreased LEC load secondary to anterior capsular polishing. However subsequent proliferation and migration of the residual LECs lead to PCO in this group. This could also explain the PCO trend in this group.

Although the aim of study was not to analyze the type of PCO between the two groups, but there were more cases of PC fibrosis noted in group II as compared to group I. This difference was not statistically significant, and more over this should be analyzed with caution since in not every case note the type of PCO was mentioned. However, it was interesting to note that all the three cases (one in group I and two in group II) in which YAG capsulotomy did not improve the visual acuity were noted to have PC fibrosis. This is consistent with the fact that PC fibrosis gives far less symptoms as compared to Elschnig pearls.

Two cases in group II showed IOL decentration, which was minimal. One patient in group I and five patients in-group II developed anterior capsular fibrosis. The data was too small to reach any statistical significance, but it again shows that anterior capsular polishing decreases the rate of anterior capsular fibrosis. [14]

As far as the surgical technique of anterior capsular polishing is concerned on average it took 3.14 minutes to perform meticulous anterior capsular polishing, and no complication was noted because of it. However, as mentioned by other authors[15,21] as well, this technique has the limitation of the effective removal of LECs from 12 o' clock position.

Our results show that meticulous anterior capsular polishing significantly reduces the rate of PCO formation in early post operative period as compared to routine surgery and appears to at least delay posterior capsular

opacifcation, but this difference vanishes in two years time. We believe that cleaning only the anterior capsular cells does not give any long term advantage over standard surgery in preventing PCO, but if every attempt is made to clear the E cells than there is possibility that the incidence of PCO will be reduced. However with the current techniques and instrument it is almost impossible to remove all the retained lens epithelial cells.

In conclusion these results show that anterior capsular polishing does not decrease the incidence of YAG capsulotomy but it may delay the opacification of posterior capsule and hence the need for an early YAG capsulotomy

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