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RESEARCH ARTICLE

INCREASED MICRO PROTEIN IN AQUEOUS HUMOR CAN CAUSE "AFTER CATARACT"

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ABSTRACT

Aim: Postoperative inflammation is a known contributory factor in posterior capsular opacification. Ocular inflammatory response was studied by measuring micro protein levels in aqueous.

Method: Aqueous tap was done during needling for PCO in 25 secondary cataracts. Equal number of age and sex matched cataract surgical cases were taken as controls.

Results: Aqueous micro protein level was found to be higher in "after cataract" cases.

Conclusion: This inexpensive method to study ocular inflammatory response was found to be helpful in prevention of posterior capsular opacification by using NSAIDs in all cases of Grade 1 PCO.

INTRODUCTION

After-Cataract is the most common long-term complication of current forms of cataract surgeries (SICS, Phacoemulsification & ECCE). It is caused by lens epithelial cells (LEC) migrating between IOL and posterior capsule (regenerative after-cataract) or Transdifferentiating LECs (fibrotic after-cataract). This results in a decrease in visual acuity after surgery^[1]. After-cataract is treated by cutting an opening into the posterior capsule with a neodymium:YAG laser. Laser treatment is associated with complications, high costs and is not readily available in the developing world. There are not many studies regarding the role of inflammation in formation of PCO. This paper tries to look into this aspect through some inexpensive and easily performable procedure available with any hospital. Two main barriers form the blood-ocular barriers system: the blood-aqueous barrier and the blood-retinal barrier^[2]. They combine to maintain the eye as a privileged site and are essential for normal visual function. These secondary cataracts frequently show clinical signs of blood-aqueous barrier impairment.

Laser flare meter is a standard tool for assessment of blood aqueous barrier and this corresponds with aqueous humor protein in vivo^[2] (Cunha-Vaz, 1997). As we don't have laser flare meter, to analyze these alterations, we examined aqueous humor of human eyes with after cataracts.

Protein content of aqueous was measured to assess the blood-aqueous barrier in cases of after-cataracts. The purpose of this study is to examine the role of inflammation vis-à-vis breakdown of Blood aqueous barrier in cases of posterior capsular opacification with a simple procedure.

MATERIALS AND METHODS

25 cases of after-cataracts coming for needling who are unable to undergo Yag laser were the cohort in this study. Detailed history about the previous operation was recorded (including the type of IOL). Patients with senile cataract only were included in this study. Exclusion criteria include any history of significant preexisting inflammation, pseudo exfoliation, glaucoma. Surgical procedure: Routine aseptic surgical steps were followed after standard topical &/ peribulbar anesthesia. Aqueous humor was aspirated with a 30G needle fitted with an insulin syringe and the aqueous thus collected was transferred

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to the laboratory immediately for micro protein analysis on a semiautomatic blood analyser. Needling of the posterior capsule was completed with the same needle or through the parsplana, if the IOL is in the bag. Anterior chamber was reformed with balanced salt solution.

Slit lamp examination: Posterior capsular opacity was classified according to the clinical nature and a clinical grading was done as follows: (Fig.1)

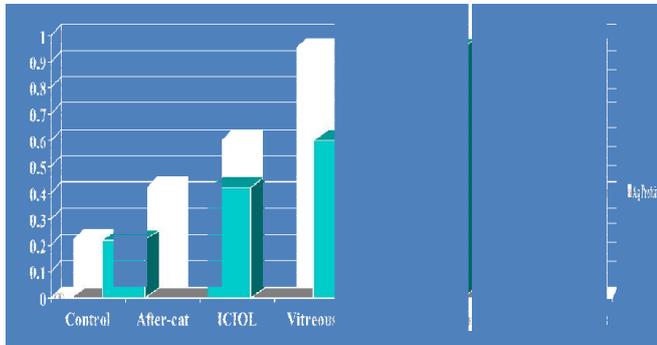


Figure 1. Aqueous protein concentrations

	Secondary cataracts	Normal control	P value
Aq Pr (mg/ml)	0.41 ± 0.16	0.22 ± 0.11	0.001
P value	P < 0.05 Wilcoxon-Mann-Wh		0.001

Table 1. Aqueous protein levels

	PCO in ECCE	PCO in SICS	Cataract	P value
Aq Pr (mg/ml)	0.21 ± 0.05	0.22 ± 0.08	0.6	0.9
P value	P < 0.05 Wilcoxon-Mann-Wh			

Table 2. Aqueous protein comparison

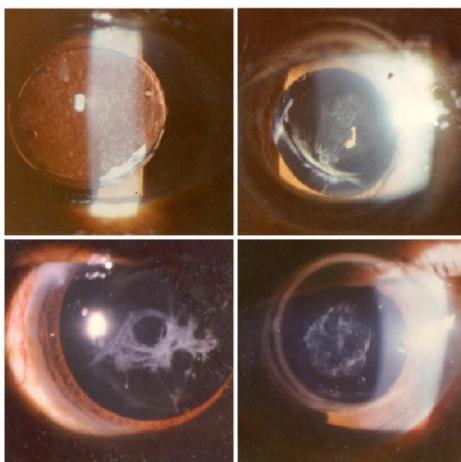


Figure 2. Types of PCO

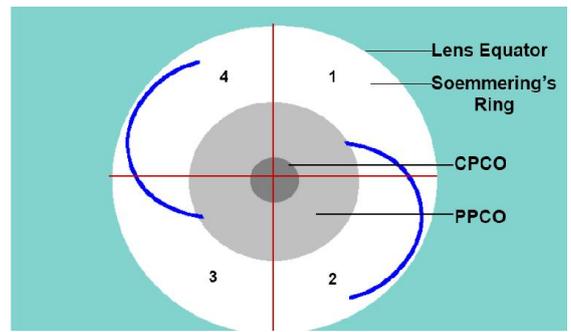


Figure 3. Schematic illustrations of PCO

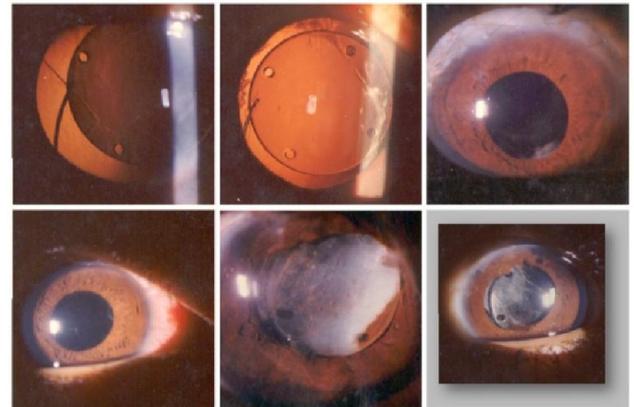


Figure 4. PCO Scores

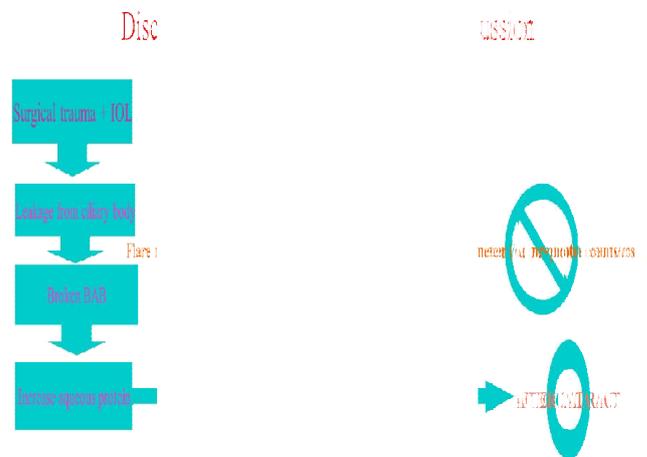


Figure 5. Flow chart of PCO

- 0: no opacity observed in dilated pupil.
- 1: opacity observed in dilated pupil.
- 2: opacity observed in dark-adapted pupil.
- 3: opacity observed in light adapted pupil.
- 4: opacity observed covering pupil.

PCO was also categorised as follows (Figure 2)

- Central PCO: corresponding to the area that including the optic of the IOL within the pupillary area.
- Peripheral PCO: corresponding to the area that including the optic of the IOL outside the pupillary area (Dilated pupil)
- Soemmering's Ring: area outside the optic of the IOL and inside the capsular bag;

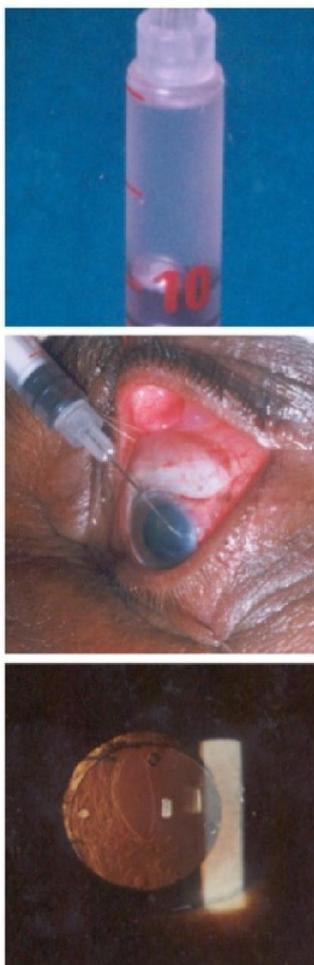


Figure 5a. Steps of capsulotomy

Statistical analysis was done using Wilcoxon-Mann-Whitney test and $P < 0.05$ was considered as significant.

RESULTS

23 patients were included in this study of which 2 patients had bilateral secondary cataract. Their age ranged from 46 to 72 years (mean 56 years). Male female ratio was 1:0.8. 25 eyes with after cataract were included in this study. Bio microscopically, posterior capsular opacity was divided into five groups (Fig: 3):

- **Haze:** more in early postoperative period. Usually does not require needling.
- **Folds:** more in early postoperative period. Usually does not require needling
- **Fibrosis:** more in late postoperative period. Requires needling.
- **Pearls:** more in late postoperative period. Requires needling.
- **Plaque:** pre-existing, more in brown cataract.

In both ECCE and SICS cases, aqueous protein concentration was significantly higher in secondary cataract (mean 0.42 ± 0.16 mg/ml) than in normal cataract eyes (0.22 ± 0.08 mg/ml, $P < 0.05$ Wilcoxon-Mann-Whitney test) (Table 1, 2, 3). There

was no significant difference between SICS and ECCE cases. It was still higher with iris claw lens or when there was vitreous in anterior chamber (mean 0.6 mg/ml and 0.95 mg/ml respectively).

Mean time period between primary cataract surgery and needling is 14.6 months. Haze and folds gave glare problem and fibrosis gave rise to ocular pain. Fibrosis and haze cases had higher protein concentration.

DISCUSSION

Human aqueous humor contains following proteins: prealbumin, albumin, alpha 1-acid glycoprotein and transferrin. There was a significant increase in the level of these proteins in case of secondary cataracts. This rise in protein follows from the leaky vessels of the ciliary body to the anterior chamber after cataract surgery. After-cataract formation occurs due to proliferation of lens epithelial cells for which the triggering factor could be breakage of blood aqueous barrier.

Laser flare cell meter photon counts/ms may be converted into an equivalent anterior chamber total protein concentration.^[2]

Haze was more in cases with history of post-operative fibrinous reactions. Fibrosis and folds were more in cases of irregular capsulorrhexis.^[3] Folds were associated with decentered IOLs which may press on ciliary body to give rise to sustained breakage of BAB. The shortcomings of this study are relatively smaller cohort size and lack of corroboration with other sophisticated quantitative analysis of Aqueous humor.

Conclusion

These results substantiate increased aqueous protein concentration and aqueous barrier impairment in after cataracts. Modalities which could restrict breakage of BAB and restore the same at the earliest could be beneficial in dealing with this complication. However, needling is a relatively inexpensive method, which could be used, where no laser facility is available or there is high risk of retinal detachment.

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