HAPTIC LOCATION IN PSEUDOPHAKIC EYES AND NONINFECTIOUS POSTOPERATIVE INFLAMMATION- A PROSPECTIVE STUDY

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ABSTRACT

BACKGROUND

Postoperative noninfectious inflammation after cataract surgery, which can be persistent, remains an undesirable consequence despite many advances in surgical techniques. This ocular inflammation after cataract surgery presents ophthalmologists with a treatment dilemma. The aim of the study was to evaluate and correlate the IOL haptic location and the presence of noninfectious postoperative inflammation in pseudophakic eyes using Ultrasound Biomicroscopy (UBM).

MATERIALS AND METHODS

In this prospective study, 80 eyes of 80 cataract patients underwent SICS with 6 mm optic non-foldable PCIOL implantation. Post surgery, an examination protocol was followed wherein the patients were assessed by slit-lamp examination on day 1, 2, 7, 14 and 30 for flare and cells. A UBM examination was performed on day 30 for locating the IOL haptic position. Finally, the postoperative inflammation was correlated with IOL haptic position.

RESULTS

The results showed that IOL haptic position outside the capsular bag significantly increased the amount and duration of postoperative inflammation.

CONCLUSION

Haptic position outside the bag increases the incidence and duration of postoperative inflammation significantly. In patients undergoing SICS, the aim should be a large continuous curvilinear capsulorhexis within the bag implantation of IOL. UBM examination on day 30 after surgery to know position of IOL haptics outside the bag will be helpful in decreasing apprehension of operating surgeon and suggesting prolonged need of steroids in cases having more than expected postoperative inflammation.

KEYWORDS

Ultrasound Biomicroscopic, IOL Haptic, Postoperative Inflammation.

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BACKGROUND

Postoperative noninfectious inflammation after cataract surgery, which can be persistent, remains an undesirable consequence despite many advances in surgical techniques. This ocular inflammation presents ophthalmologists with a treatment dilemma. There are no established guidelines for the treatment of inflammation induced by cataract surgery. While corticosteroids are traditionally the therapy of choice for inflammation, their long-term use for managing ocular inflammation can produce significant adverse events especially with regard to elevated Intraocular Pressure (IOP).[1]

We present the results of a prospective study correlating the position of Posterior Chamber Intraocular Lens (PCIOL) haptics and degree of noninfectious inflammation in cases after Small Incision Cataract Surgery (SICS). Ultrasound Biomicroscopy (UBM) was used to find out the position of PCIOL optic and haptics in all cases in our study. It produces cross-sectional images of anterior segment structures providing a lateral resolution of 50μ and axial resolution of 25μ with a depth of penetration of approximately 4-5 mm (up to pars plana region of the eye). In most eyes with

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PCIOL, an UBM imaging can show whether the IOL haptics are in the capsular bag, in the ciliary sulcus or in some other anatomic location. Lens subluxations, loss of zonular integrity can be picked up quite clearly on UBM examination.

Our study will help to explain the cause of more than expected noninfectious postoperative inflammation in a large number of cataract surgery cases if UBM is available to locate position of IOL haptic. This will help in alleviating unnecessary stress on the operating surgeon.

MATERIALS AND METHODS

A prospective analysis of 80 patients who underwent SICS cataract surgery with intraocular lens implantation at a tertiary care eye centre over a period of 4 months was done. Cases operated by phacoemulsification technique were excluded from the study as most cases have in the bag implantation of PCIOL. Cataract cases that came to eye OPD and required surgery after examination and declared fit after investigations in preanaesthetic checkup were included in the study.

The cases excluded from the study were cases of glaucoma, uveitis, dislocated cataract, traumatic cataract, very hard grade cataract, subluxated cataract, poor cornea, pseudoexfoliation, corneal opacity, high myopia, small non-dilating pupil and diabetes mellitus. Cases with unusually more iris touch during surgery, posterior capsular rent and anterior vitrectomy, history of allergy to drugs, diabetes mellitus and connective tissue disorders were also excluded from the study. All cases with any other intraocular or postoperative complication were excluded from the study.

All 80 patients (80 eyes) underwent standard SICS with PCIOL implantation. There was no ethical issue as SICS technique of cataract surgery is used by ophthalmologist's world over. All surgeries were performed by a single surgeon. All the cases had standard scleral tunnel incision. Continuous curvilinear capsulorhexis was attempted in all cases. However, cases in which it could not be done were converted to anterior can opener capsulotomy. Relaxing capsular incisions had to be given in some cases. Lens expression and 6 mm optic, 12.5 mm overall diameter PMMA intraocular lenses were implanted in all cases.

Postoperative noninfectious inflammation can also be caused due to irrigating fluid, viscoelastic or IOL used during cataract surgery. Therefore, same brand and batch of irrigating balanced salt solution, viscoelastic and PCIOL were used in all cases.

The patients were examined on day 1, 2, 7, 14 and 30. A detailed slit-lamp examination was performed for anterior chamber flare and cells. The degree of postoperative inflammation considered significant was established and noted. Significant inflammation defined as on day 1,2,7,14 and 30 of study as per table (Table 1). Any degree of cells or flare after 04 weeks was considered significant. An UBM examination was performed on day 30 for locating the PCIOL optic and haptic position. The UBM findings revealed the IOL haptics either both in the bag, both in the sulcus or one in the bag and one in the sulcus (Figure 1 and 2 and Table 2).

The variables of interest were degree of postoperative inflammation and haptic location as assessed by UBM.

Statistical Analysis

Data were analysed using statistical package SPSS (V15; SPSS, Chicago, Illinois, USA). Variables were tested for normal distribution and nonparametric tests were used where required. Chi-square test was used to access intraocular inflammatory response with haptic position of IOL. Pearson's correlation coefficient was used to obtain the relation between quantitative variables. All statistical tests were two-sided and the threshold for statistical significance was $p<0.05$.

RESULTS

Age of patients ranged from 49 to 69 years. 48 patients were male and 32 female. Gender difference was not statistically significant. It was noted that 12 (15%) cases had one haptic of PCIOL in the capsular bag and one haptic in the sulcus. 28 cases (35%) had both the PCIOL haptics in the sulcus. 40 (50%) cases had both the haptics of PCIOL in the capsular bag as noted on UBM examination (Table 2). Finally, cases were tabulated mentioning the degree of inflammation and correlating it with the position of PCIOL haptics on days 1,2,7,14 and 30 (Table 3). It is clearly evident from this table that the IOL haptic position outside the bag and in the sulcus significantly influences and increases the course of postoperative inflammation and these are significant on day 1,2,7,14 and 30 (Histogram 1). Results of the study were statistically analysed by chi-square test. All 100% cases with both haptics in the sulcus and one haptic in the bag and one in the bag were associated with noninfectious postoperative inflammation as compared to 55% cases having both the haptics in the bag on day 1. The above trend continued till day 30 of the study when 42.8% cases with both haptics in the sulcus and 25% cases with one haptic in the bag and other in the sulcus still had noninfectious postoperative inflammation. As compared to above, no case having both haptic in the bag had noninfectious postoperative inflammation on day 30. This suggested that cases with both the PCIOL haptics in the bag had the best outcome with minimal inflammation for the shortest duration as compared to cases where only one of the haptics was in the bag. Cases with both the haptics outside the bag had the worst outcome. These values were statistically significant ($p<0.05$).

Day	Flare	Cells
1	>2+	>2+
2	>2+	>1+
7	>1+	0
14	>1+	0
30	>1+	0

Table 1. Following Grades of Inflammation were Considered as Significant

Position of Haptic	Number of Cases (80 Cases)
One in Bag, One in Sulcus	12/80 (15%)
Both in Sulcus	28/80 (35%)
Both in Bag	40/80 (50%)

Table 2. UBM Findings (Day 30)

Position of Haptic	Day 1	Day 2	Day 7	Day 14	Day 30
One in Bag, One in Sulcus (12 cases)	12/12 (100%)	12/12 (100%)	10/12 (83%)	7/12 (58%)	3/12 (25%)
Both in Bag (40 cases)	22/40 (55%)	19/40 (47.5%)	4/40 (10%)	1/40 (2.5%)	0/40 (0%)
Both in Sulcus (28 cases)	28/28 (100%)	28/28 (100%)	27/28 (96%)	20/28 (71%)	12/28 (42.8%)
Total	**62**	**59**	**41**	**28**	**15**

Table 3. Postop Inflammation Correlated with Haptic Location

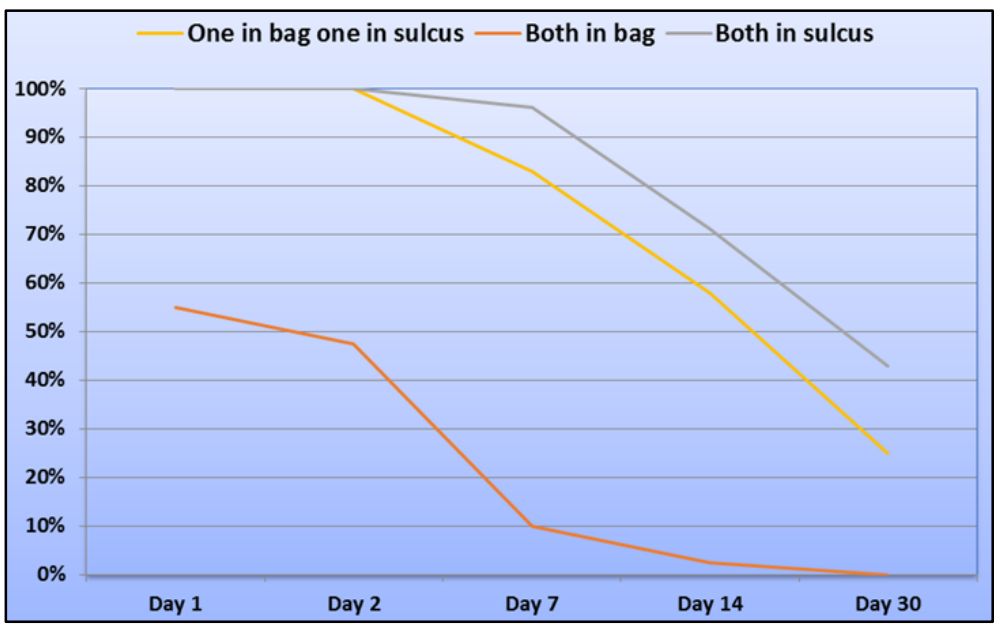

Figure 1. Histogram

Photo 1. UBM Showing in the Bag IOL Haptic

Photo 2. UBM Showing IOL Haptic in the Sulcus

DISCUSSION

There are various methods of cataract surgery. Present day methods include Extracapsular Cataract Extraction (ECCE), Small Incision Cataract Surgery (SICS) and Phacoemulsification with Posterior Chamber Intraocular Lens (PCIOL) implantation. Phacoemulsification surgery requires need of costly machine and greater expertise. ECCE and SICS surgery does not require costly machine and is practiced regularly by the ophthalmologists at almost all eye centres world over.

Surgery of the eye causes breakdown of the blood-aqueous barrier resulting in protein leakage and cellular reaction in the aqueous humour manifested clinically as flare and cell. Postoperative inflammation of eye is normal. However, what constitutes normal inflammation and what is considered out of the ordinary inflammation is unclear. Knowing patient and surgical characteristics that may predispose individuals to increased inflammation following surgery is, thus, important for postoperative management and diagnosis. Using anterior segment fluorophotometry, Sanders and associates demonstrated that large limbal incisions caused significant blood-aqueous barrier breakdown.[2] Various studies have been done correlating postoperative inflammation and cataract surgery incision size. Clinically, phacoemulsification has been observed to cause less postoperative inflammation than extracapsular cataract extraction due to smaller incision size.[3] Oshika and colleagues compared patients undergoing surgery by planned 11-mm incision extracapsular cataract extraction to patients receiving phacoemulsification with non-foldable IOLs (7 mm incision) and foldable IOLs (4 mm incision) and found that both aqueous flare and cell count measured with the laser flare cell meter were highest postoperatively in the 11-mm incision group with less inflammation noted in decreasing order by the 7- and 4-mm incision groups.[4] In addition, the flare intensity in all incision groups remained significantly higher than those of age-matched normal controls for up to 6 months following surgery.[5] However, Corbett and partners reported no difference in postoperative inflammation between extracapsular cataract extraction through a 12-mm incision or phacoemulsification with a 7-mm incision.[6] To neutralise these factors, we used standard incision size, used same brand and batch of irrigating balanced salt solution, viscoelastic and non-foldable 6 mm optic 12.5 mm overall diameter PCIOL in all cases.

Postoperative inflammation can also increase due to previous intraocular surgery, greater technical difficulty of the operation, non-white race and brown iris pigmentation.[5] In addition, intraoperative factors such as iris manipulation, posterior capsular rent, anterior vitrectomy, prolonged surgical time and toxic reactions to irrigating solutions, viscoelastic products or polishing agents on IOLs may also cause greater blood-aqueous barrier breakdown and leakage leading to more pronounced postoperative inflammation.[6-10] Also, cases of glaucoma, uveitis, dislocated/subluxated cataract, traumatic cataract, pseudoexfoliation, corneal opacity, poor cornea, diabetes mellitus, high myopia and small non-dilating pupil were excluded from the study. Cases with unusually more iris touch during surgery, history of connective tissue disorders and allergy to drugs were also excluded from the study for better comparison of results of the study.

Ultrasound Biomicroscopy (UBM) was used to locate the position of haptic and PCIOL postoperatively. It is a high resolution ultrasound technique and allows imaging of structural details of the anterior ocular segment at near microscopic resolution in living patients.[11-14] It provides detailed two-dimensional gray scale images of epibulbar conjunctiva, cornea, limbus and anterior sclera, aqueous chambers, anterior chamber angle structures, ciliary body, crystalline lens, zonules and anterior vitreous. The transducer frequency of UBM is 50 MHz in contrast to 7.5-10 MHz of conventional ultrasound. It produces cross-sectional images of anterior segment structures providing a lateral resolution of 50μ and axial resolution of 25μ with a depth of penetration of approximately 4-5 mm (up to pars

plana region of the eye). Having few indications in late 1980's when it was introduced; today, it has a wide range of clinical applications ranging from cornea, glaucoma, retina, trauma and a host of others. It displays the anterior segment anatomy of angle, iris, ciliary body, lens and anterior vitreous clearly in cloudy/opaque corneas. Postoperatively, UBM can show the location of PCIOL and the positioning of the haptics. A PCIOL appears on UBM as a highly reflective plate (corresponding to the lens optic) in the retropupillary plane with reverberation artefacts behind it. In most eyes with PCIOL, an UBM imaging can show whether the IOL haptics are in the capsular bag, in the ciliary sulcus or in some other anatomic location. Lens subluxations, loss of zonular integrity can be picked up quite clearly on UBM examination.

In our study, we could clearly locate postoperatively with the help of UBM, the location of Intraocular Lens (IOL) and the position of the haptics whether they were in the capsular bag, in the ciliary sulcus or some other anatomic location. Haptic position outside the bag increased the incidence of postoperative inflammation requiring longer requirement of postoperative steroids. These results were statistically significant.

CONCLUSION

This study has brought out that location of haptic of PCIOL is a significant factor in causation of noninfectious postoperative inflammation after cataract surgery. In the bag implantation of intraocular lens is the most physiological and desirable. In patients undergoing ECCE/SICS, the aim should be a large continuous curvilinear capsulorhexis within the bag implantation of PCIOL. In patients where a can opener capsulotomy is performed, there is a likelihood that IOL haptic may become lodged in the ciliary sulcus. In cases having more than expected noninfectious postoperative inflammation, if available UBM study on day 30 to locate position of IOL haptic should be included in protocol. This will help in alleviating unnecessary stress on the operating surgeon. Accurate localisation of IOL haptics outside the capsular bag is definitely an indicator for more than normal postoperative inflammation and needs longer follow-up and topical steroids.

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