Original Article

Intraocular Pressure after IOL Implantation with Hydroxypropylmethylcellulose 2% vs Hydro-implantation

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Purpose: To compare post-operative intraocular pressure between intraocular lens (IOL) implantation using hydroxypropylmethylcellulose (HPMC) 2% and IOL implantation by hydro-implantation technique after phacoemulsification.

Material and Methods: This comparative, prospective study with convenience (Non Probability) sampling was conducted on 100 patients. We divided the patients into two groups. Fifty patients (Group A) had IOL implantation with HPMC 2% and 50 patients (Group B) had IOL with hydro-implantation after phacoemulsification of the lens. Post-operative IOP changes were compared with the preoperative IOP of the same group and between the two groups at 24 hours and 7th post-operative day. A p-value < 0.05 was used as significance cut off point.

Results: There was no significant difference in mean pre-operative IOP of both groups (p-value = 0.480). Group A, experienced statistically significant elevation in mean IOP at 24 hours after surgery, over the pre-operative values (p-value: 0.021). Elevation in mean IOP in Group B at 24 hours after surgery was found insignificant (p-value: 0.154). Difference between mean post-operative IOP of the two groups at 24 hours after surgery was also significant (p-value: 0.032). On 7th day after surgery, mean IOP in both groups had returned to approximately pre-operative values.

Moreover, the mean IOP values at 7th post-operative day were also comparable between the two groups (p-value: 0.420).

Conclusions: Compared with the use of HPMC for IOL implantation, hydro-implantation of IOL resulted in insignificant rise in post-operative IOP at 24 hours.

Ophthalmic viscosurgical devices (OVDs) are being used successfully in many ophthalmic surgeries, most commonly in cataract surgery[1]. OVDs help in cataract surgery by maintaining the depth and shape of anterior chamber (AC) especially in the stages of capsulorhexis and IOL implantation[2]. They also provide viscous protection to the delicate corneal endothelium from surgically induced trauma[3].

Based on their rheological properties OVDs have been classified as cohesive and dispersive[4]. The cohesive OVDs have high viscosity, high molecular weight and contain long molecular chains, dispersive OVDs like hydroxypropylmethylcellulose 2% (HPMC) have lower viscosity with shorter molecular chains that have less tendency to entangle[5].

Use of OVDs in cataract surgery can be associated with adverse effects; the most commonly and potentially dangerous is the rise, usually transient, in post-operative intra ocular pressure (IOP)[6]. To prevent this complication, the OVD should be removed through aspiration after intraocular lens (IOL) implantation; however, an OVD located in the ciliary sulcus or behind the IOL may not be easily removed.

Hydro-implantation is a technique of implanting IOL under continuous irrigation from either irrigation cannula of phacoemulsification machine or Simco cannula without using OVDs.

We conducted a study to evaluate the effect on IOP following phacoemulsification with IOL implantation by either using OVD (HPMC 2%) or hydro-implantation of IOL.

MATERIAL AND METHODS

This comparative, prospective study with convenience (Non Probability) sampling was conducted from September 2011 to March 2012 at LRBT Eye Hospital Mandra, Rawalpindi. Patients with ages from 50 years to 75 years were selected for the study. The patients were first allotted the hospital registration number before proceeding to the examination. Complete eye examination was performed. Eyes with senile uncomplicated cataracts were selected.

Patients with pre-operatively raised IOP, previous history of glaucoma or narrow/closed angle on gonioscopy were excluded. Dark brown cataracts were also excluded because of a likelihood of converting to ECCE or prolonged phacoemulsification time. Cases that had any serious complication like posterior capsule rent with or without vitreous loss were also excluded from the study. One hundred patients meeting the inclusion and exclusion criteria were selected for the study and were divided into two groups, A and B of 50 patients each. The study procedure and its aims were explained to all the patients before beginning the treatment and they had to sign on informed written consent form.

Pre-operative IOP (baseline IOP) was again checked and recorded one day prior to surgery.

A 3.25mm clear corneal incision and two side ports were constructed at 10 and 2 O'clock positions in all patients. Anterior chamber (AC) was filled with HPMC and capsulorhexis was carried out. Phacoemulsification was done with same technique in both groups.

In group A after completion of phacoemulsification, incision was enlarged to 5.5mm after maintenance of AC and capsular bag with HPMC and 5.5mm rigid PMMA IOL was secured in capsular bag. HPMC was aspirated thoroughly from the AC, the angle, the capsule fornix and the retrolenticular space using Simco cannula. Side ports and main incision were sealed with stromal hydration.

In group B after completion of phacoemulsification, incision was enlarged after maintaining the AC by the inflow of the fluid from the Simco cannula held in non dominant side's side port (left side in our case). PMMA IOL was held with McPherson forceps in the right hand and advancing haptic of IOL was inserted through the main incision, pushing it forward and downward, with an angle of 45-50 degrees, securing it in the capsular bag. Through main incision, with the IOL dialer, IOL was engaged from the haptic-optic junction. With a forward, downward and clockwise movement trailing haptic was secured in the capsular bag. As no OVD was used for implantation of IOL, no removal of OVD was required. Side ports and main incision were sealed with stromal hydration.

IOP measurements were done at 24 hours and 1 week post-operatively in both groups and were compared with the baseline IOP (preoperative). IOP measurement was carried out by the same ophthalmologist on same instrument used for pre-operative IOP measurement.

Analysis of the data was carried out using statistical package for social sciences (SPSS) version 13.0. Student 't' test was used to compare the mean IOP of each group at each time interval. 't' test was also applied for comparison of results between the two groups. A p-value < 0.05 was used as significance cut off point.

RESULTS

Data of 100 patients (47 males and 53 females) was analyzed. Out of those, 50 (24 males and 26 females) were in group A (2% HPMC group) and 50 (23 males and 27 females) were in group B (hydro-implantation group). Age spectrum was from 56 to 72 years in group A and from 54 to 74 years in group B. The age difference between the two groups was statistically insignificant (p-value: 0.275). There was no significant difference in mean pre-operative IOP of both groups (p-value: 0.483), Table 1. No patient in either group had a pre-operative IOP greater than 19mm of Hg. Group A experienced statistically significant elevation in mean IOP at first 24 hours after surgery, over the pre-operative values (p-value: 0.021), Table-2. Elevation in mean IOP in Group B at first 24 hours after surgery was found insignificant over the pre-operative values (p-value: 0.154), Table-2. Difference between mean post-operative IOP of the two groups at 24 hours after surgery was also compared and found significant (p-value: 0.032). On 7th day after surgery,

mean change in IOP from their respective baselines in both groups was found insignificant and IOP in both groups had returned approximately to the pre-operative values, Table 3.

Moreover, the mean IOP values at 7th post-operative day were also comparable between the two groups (p-value: 0.420).

Table 1: Mean pre-op IOP (Baseline IOP).

Group A	14.5±1.79mm of Hg
Group B	14.3±2.0mm of Hg

Table 2: Mean change in IOP from the baseline at first 24 hours of surgery.

Group A	2.76± 1.74mm of Hg	p-value: 0.021
Group B	0.56± 1.23mm of Hg	p-value: 0.154

Table 3: Mean change in IOP from the baseline at 7th day.

Group A	0.31± 1.34mm of Hg	p-value: 0.123
Group B	0.23± 1.22mm of Hg	p-value: 0.186

DISCUSSION

Elevated IOP is common post-operative complication following phacoemulisification[7]. OVD remaining in the eye may cause mechanical obstruction of the trabecular meshwork and is a major cause for early post-operative rise in IOP[8].

The particles of low-viscosity OVDs like HPMC are considered dispersive, because they do not adhere to one another. Dispersive OVDs protect individual structures in the anterior chamber such as the corneal endothelium better than cohesive OVD[9]. However, low-viscosity OVDs are generally more difficult to remove from the eye completely because of their dispersive nature[10].

Arshinoff had published multiple studies comparing different OVDs[4,11-13]. He concluded that, if not completely removed, all OVDs cause post-operative increases in IOP. According to Arshin off et al, all high-viscosity OVDs are associated with higher post-operative IOPs (although not necessarily above 21mm Hg) compared with lower-viscosity OVDs. He concluded that retained viscoelastic and predisposetions like trabecular insult or undiagnosed glaucoma are the main causes of post-operative rises in IOP.

A local study conducted by Waseem et al[14] compared the effect on IOP between HPMC and sodium hyaluronate (Cohesive OVD) and concluded that IOP rises in both groups but more significantly in sodium hyaluronate group.

In 1983, Berson et al[15] also reported that sodium hyaluronate when injected into the anterior chamber caused increase in IOP ranging from 55 to 60mm of Hg due to blockade of trabecular meshwork.

Thorough removal of OVD is vital for avoidance of a post-operative IOP increase. However, complete removal of the OVD behind the IOL is known to be difficult. Several surgical techniques for removal of OVD, particularly from behind the IOL, have been described[16], however, complete avoidance of a post-operative IOP increase has not been achieved with any technique.

In our study, we used hydro-implantation technique for IOL implantation in one group. No spike of raised IOP was recorded at any time interval in this group. This indicates that hydro-implantation did reduce the risk for elevated post-operative IOP. Our results are augmented by a study conducted by Tak[17] for foldable IOL implantation using hydro-implantation.

The learning curve of the technique is short but the beginner might find some difficulties in implantation IOL with this technique initially. In case of any difficulty, surgeon can always shift back to conventional method of IOL implantation with OVD.

CONCLUSION

We conclude that hydro-implantation technique can reduce the risk for post-operative high IOP and related ocular co-morbidities.

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