ORIGINAL ARTICLE

COMPARISON OF EFFECT OF SODIUM HYALURONATE AND HYDROXY PROPYL METHYLCELLULOSE ON INTRAOCULAR PRESSURE AFTER CATARACT SURGERY

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ABSTRACT

Background: Viscoelastic substances protect the intraocular structures against vibration and mechanical damage. However, these may cause increase in intraocular pressure. The aim of this study was to compare the effect of sodium hyaluronate and hydroxypropyl methylcellulose on intraocular pressure after cataract surgery in the early post-operative period.

Material & Methods: This cross-sectional comparative study included one hundred patients with age related cataract, admitted at KIOMS, Hayatabad Medical Complex, Peshawar, from December 2004 to June 2005. In 50 patients sodium hyaluronate was used and in 50 hydroxyl-propyl-methylcellulose as viscoelastic substance. The surgical procedure in all cases was manual suture-less small incision cataract surgery through scleral tunnel. IOP was measured with Goldmann applanation tonometer pre and post-operatively in the evening on the day of surgery and next morning. Means, standard deviations, percentages, and p-values were measured.

Results: Among 100 patients, 51(51%) were males and 49(49%) females. Age range was 50 to 100 years with a mean of 61.4. Pre-operative IOP in both groups differed slightly ($p=0.72$). IOP recording in the evening on day following surgery showed a significant rise in both groups. This elevation in IOP was more in the Na-HA group than HPMC group ($p=0.003$). The IOP returned to almost normal in both groups the next morning following surgery. In the evening on the day of surgery, the IOP rise above 21 mmHg was found in 16(32%) cases in Na-HA and 8(16%) cases in HPMC group. The maximum IOP rise in Na-HA group recorded was 44 mmHg while 33 mmHg in HPMC group. In the next morning, IOP rise above 21 mmHg was recorded in 5(10%) cases in Na-HA and 2(4%) in HPMC group ($p>0.05$).

Conclusion: Both sodium hyaluronate and hydroxylpropyl methylcellulose significantly increase intraocular pressure in the early postoperative period following cataract surgery. We recommend careful monitoring of IOP following cataract surgery.

KEY WORDS: Glaucoma; Hyaluronic acid; Methylcellulose; Intraocular pressure.

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INTRODUCTION

Modern microsurgical techniques have revolutionized ophthalmic surgery. The use of viscoelastic substances as intraoperative tool is imperative, particularly in cataract surgery. These play a vital role to protect the intraocular structures against vibration and mechanical damage.[1-3]

Sodium hyaluronate (Na-HA) and hydroxypropyl methylcellulose (HPMC) play an important role to provide protection to the endothelium and other ocular structures during cataract surgery. On the other hand, these substances have the drawback of causing increase in intraocular pressure (IOP) which can lead to irreversible visual loss.[4,5]

Na-HA is a biological product found in almost all connective tissues (CT) in living organisms. Its important characteristic is its ability to stabilize cells

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and tissues and thus avoid their permanent deformation. It has many sources like umbilical cord, vitreous and rooster comb. In addition, low molecular weight Na-HA can be obtained by microbial fermentation from streptococci. In the eyes its highest concentration is in the cortical gel and trabecular angle. A small amount is also found in the aqueous. It also covers the corneal endothelium. In summary, Na-HA helps in ophthalmic microsurgery by maintaining anterior chamber depth, temponading small breaks in posterior capsule, facilitates intra ocular lense (IOL) insertion, protects corneal endothelium from damage by instruments and minimizes endothelial cell loss during anterior segment surgery. HPMC is also a viscoelastic substances. Its main sources are wood pulp and cotton. It consists of long chains of glucose molecules with replacement of hydrogen and hydroxyl group by methoxypropyl and hydroxypropyl side chains.[6-11]

The aim of this study was to compare the effect of Na-HA and HPMC on intraocular pressure after cataract surgery in the early postoperative period.

MATERIAL AND METHODS

This cross-sectional comparative study was conducted at Khyber Institute of Ophthalmic Medical Sciences, Postgraduate Medical Institute, Hayatabad Medical Complex, Peshawar, from December 2004 to June 2005.

It included one hundred eyes of hundred adult patients with age-related cataract. Patients with complicated and traumatic cataracts, those who developed intraoperative complications like hyphema, vitreous loss or vitreous hemorrhage, and patients with ocular co-morbidity, were excluded.

Patients were divided into two equal groups, each comprising of 50 patients. A comprehensive proforma was designed. A detailed history regarding patient's personal data, duration of visual complaints, history of any systemic or ocular co-morbidity, previous ocular surgery, use of drugs, diabetes and hypertension and family history was taken. All patients underwent thorough clinical examination including checking of visual acuity, pupillary reaction, anterior segment examination with slit-lamp and IOP both pre and post-operatively in the evening on the day of surgery and the next morning following cataract surgery. Detailed posterior segment examination was also carried out in all patients with direct ophthalmoscope and indirect ophthalmoscope as well as slit lamp indirect bimicroscopy with the help of 78D/90D lens.

In one group, 1.8% Na-HA (Megacrom; Croma Pharma Gmbh, Austria) was used intraoperatively, while in other group, 2% HPMC (Visicrom; Croma Pharma Gmbh, Austria) was used intra-operatively.

Mean, standard deviation (SD), and percentages were calculated for both groups to measure the effect on the postoperative IOP, and to compare the statistical significance of results.

RESULTS

Among 100 patients, 51 (51%) were males and 49 (49%) females. The age range was 50 to 100 years with a mean of 61.4 years.

Pre-operative IOP in both groups differed slightly which was statistically not significant ($p=0.72$).

IOP recording in the evening on the day following surgery showed a significant rise in IOP in both Na-HA and HPMC group. This elevation in IOP was more in the Na-HA group than HPMC group ($p=0.003$). The IOP returned to almost normal level in both groups when recorded the next morning following surgery ($p=0.16$). (Fig. 1, 2 & Table 1)

In the evening on the day of surgery, the IOP rise above 21 mmHg was found in 16 (32%) cases in the Na-HA group and 8 (16%) cases in HPMC group. The maximum IOP rise in Na-HA group recorded was 44 mmHg while it was 33 mmHg in the HPMC group. In the next morning, the IOP rise above 21 mmHg was recorded in 5 (10%) cases in Na-HA group and 2 (4%) cases in HPMC group ($p>0.05$).

DISCUSSION

The use of viscoelastic substances as intraoperative tool is imperative in modern ophthalmic surgery, particularly cataract surgery. Na-HA and HPMC are both VES and play an important role to provide protection to endothelium and other ocular

Table 1: Pre and post-operative intra ocular pressure after using sodium hyaluronate and hydroxylpropyl methylcellulose.

Time	Hydroxylpropyl methylcellulose		Sodium hyaluronate		p-value
	Mean±SD	Range (mmHg)	Mean±SD	Range (mmHg)	
Preoperative	13.6±2.48	(10-18)	13.40+2.06	(7-16)	0.72
In evening on day of surgery	21.56±7.24	(13-44)	17.88+4.67	(9-33)	0.003
Next morning	15.38±3.83	(10-25)	14.38+3.28	(10-22)	0.16

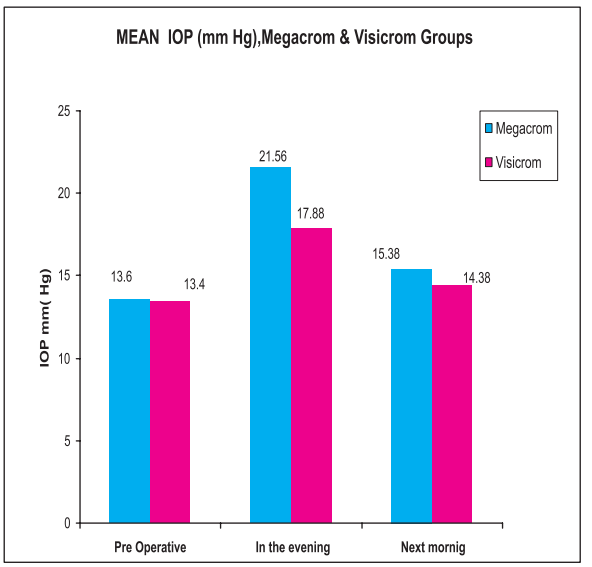

Figure 1: Intra ocular pressure after use of intra-operative sodium hyaluronate and hydroxylpropyl methylcellulose.

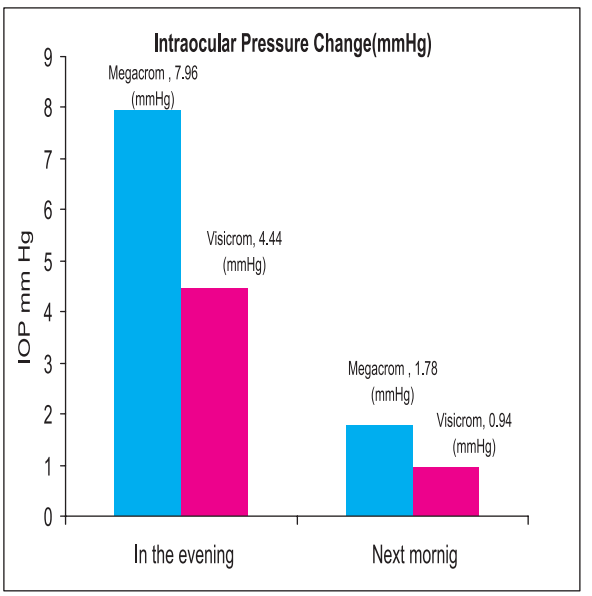

Figure 2: Postoperative intra ocular pressure changes after using sodium hyaluronate and hydroxylpropyl methylcellulose.

structures during cataract surgery. However, these have the drawback of causing increase in IOP.[5-7] Viscoelastic substances increase the IOP in the early postoperative period following cataract surgery. This postoperative increase in IOP is considered to be the consequence of remaining viscoelastic substances at the end of surgery leading to mechanical obstruction of trabecular meshwork by these substances which reduce the outflow from the anterior chamber.[9]

Our study shows that both Na-HA and HPMC cause significant increase in IOP in the early post-operative period. However, this elevation in IOP is more significant with Na-HA than HPMC. IOP recorded in the evening on the day of surgery showed a mean IOP rise of about 8 mmHg in the Na-HA group and 4.5 mmHg in the HPMC group. IOP elevation above 21 mmHg was found in 32% in the Na-HA group and 16% in HPMC group. In addition, there were more IOP spikes in the Na-HA group than the HPMC group. The maximum IOP recorded in the Na-HA group was 44 mmHg, while that in the HPMC group was 33 mmHg. However, the IOP returned to almost within the normal limit in both groups when recorded the next morning following surgery. In the Na-HA group IOP greater than 21 mmHg was found in 10% cases while in HPMC group there were only 4% cases recorded with IOP above 21 mmHg, when recorded the next morning. But the maximum values recorded in Na-HA and HPMC group were 25 mmHg and 22 mmHg respectively the next morning.

Comparing the effect of different VES on postoperative IOP after cataract surgery, Junejo & Leghari[12] found incrcase in IOP above normal in 25% cases with Na-HA & 13% cases in which Hpne was used.The dicaveated IOP recored with Na-HA was 28-40 mm Hg & with HPMC was 26-36 mm Hg. Dada et al[13] found that Na-HA significantly increased IOP (22-24 mmHg) in the early postoperative period (6-24 hours) while no such rise was observed with HPMC. This study also suggested that IOP rise in the early post-operative period though transient should be treated. Holzer et al[14] found in their study that all VES showed increase in IOP but it was more with Na-HA (1.3%) than with theres includent HPNC. Our study demonstrated that Na-HA caused higher rise of postoperative IOP as compared to HPMC. It also showed that IOP varied at different times with Na-HA and HPMC in the early postoperative period. Various studies show different results. Further studies are needed in order to support the views held. There are two important factors to which the impact of viscoelastic substances on post-operative IOP can be attributed, i.e. the molecular weight and viscosity. Both the molecular weight and viscosity of Na-HA are higher than those of HPMC. As a result, the clearance of Na-HA from the anterior segment of the eye through the trabecular meshwork is slower than HPMC.

CONCLUSION

Both Na-HA and HPMC significantly increase intraocular pressure in the early postoperative period following cataract surgery. Increase recorded with Na-HA was higher than HPMC and the spikes in the postoperative IOP with the use of Na-HA were higher and more in number as compared to those with HPMC.

We recommend careful monitoring of postoperative IOP following cataract surgery.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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None declared.