

Effects of 0.5 % and 0.25% apraclonidine on postoperative intraocular hypertension after cataract extraction

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Objective We conducted a double-masked, prospective study to evaluate the effect of 0.5 % and 0.25 % apraclonidine in postoperative intraocular pressure (IOP) increases in patients undergoing extracapsular extraction with intraocular lens implantation.

Method Fifty-four patients scheduled for extracapsular cataract extraction were randomly divided into three groups, each consisting of 18 patients. First group received one drop of 0.50 % apraclonidine topically one hour before surgery and immediately after the end of the procedure. Second group received the same regimen using of 0.25 % form of apraclonidine. The third group was the control group to which artificial tears were applied. IOP was measured at 12th hour preoperatively and at 6th and 24th hours postoperatively. All the measurements were evaluated by the same surgeon using the same Goldmann applanation tonometer without surgeon's knowledge in which group the patient was.

Results Preoperative mean intraocular pressures were 13.66± 2.76 mmHg in the first group, 14.27±2.24

mmHg in the second group and 14.5±1.34 mmHg in the control group. There were no significant differences between preoperative mean IOP of the groups ($p=0.398$).

Mean IOP at the early postoperative visit (6th hour) was significantly lower in the first group (17.44±4.95 mm Hg) when compared to the second group (21.78±7.19 mm Hg) and the control group (24.55 ±5.65 mm Hg) ($p=0.000$). Mean postoperative IOP at 24th was significantly lower in the first group (14.33±3.75 mm Hg) when compared to the second group (17.11±4.16 mm Hg) and the control group (19.61±3.20 mm Hg) ($p=0.000$).

Conclusions Our study demonstrated that topical 0.5% apraclonidine is effective for controlling early postoperative intraocular hypertension after cataract extraction without any side effects while 0.25 % apraclonidine lacked the same effectiveness.

Key words Apraclonidine, cataract surgery, IOP.

Introduction

IOP elevations after cataract extraction are well known. The IOP elevation was first described by Gormaz in 1962 and is usually detectable 6-8 hours postoperatively (1,2,3). Normally, the IOP returns to the preoperative level after 24-48 hours (4). The occurrence of postoperative intraocular hypertension after cataract extraction has been attributed to a decrease in aqueous outflow because of obstruction of the trabecular meshwork by lens material, inflammatory debris, viscoelastic substances or by collapse of the trabecular meshwork due to traction forces and tissue distortion caused by the corneal sutures. Sudden and profound increases in pressure can be hazardous to visual outcome, especially in patients with pre-existing compromised optic nerves and vasculature. Many agents have been used for the controlling of the intraocular hypertension after cataract extraction. These include aspirin, indomethacin, beta-blockers, miotics, carbonic anhydrase inhibitors and recently apraclonidine. Aspirin and indomethacin have an IOP lowering effect but this is not satisfactory (5). Ruiz et al. reported 40% intraocular hypertension in patients treated with 4% pilocarpine (6). Different results

are reported about beta-blockers on postoperative IOP controls. Beidner et al. reported that preoperative acetazolamide intake does not prevent the postoperative intraocular hypertension (7). Apraclonidine is a relatively selective alpha-2 agonist and a clonidine derivative. When used topically, it is relatively safe and has minimal clinically significant side effects. Apraclonidine decreases aqueous inflow rather than influencing outflow. When used in normal subjects, it decreases IOP in almost 40% of the cases (8), and its action is greater than 0.5% timolol maleate or levabunolol hydrochloride (9). Pollack, Robin and Brown reported significant efficacy of apraclonidine in controlling the acute rise of IOP after laser procedure on the anterior segment of the eye in different studies (10,11,12). Prata and Wilks reported good results of 1% apraclonidine at postoperative intraocular hypertension after cataract extraction (13,14).

The purpose of this study was to analyse the efficacy of 0.5% and 0.25% apraclonidine in controlling intraocular hypertension occurring after cataract extraction.

Material and Methods

Fifty-four patients scheduled for extracapsular cataract extraction with posterior chamber lens implantation, in the Eye Clinic of Van Medical Faculty, were randomly divided into three groups each consisting of 18 patients. First group received one drop of 0.5 % apraclonidine topically into the eye to be operated one hour before surgery and immediately after the end of the procedure. Second group received the same regimen using of 0.25 % form of apraclonidine. To the control group artificial tears were applied.

The first group consisted of 8 females (44.44 %) and 10 males (55.56 %). The mean age was 62.44 ± 9.87 years (range, 40 to 76 years).

The second group consisted of 7 females (38.89 %) and 11 males (61.11 %). The mean age was 64.83 ± 11.07 years (range, 35 to 72 years).

The control group consisted of 10 females (55.56 %) and 8 males (44.44 %). The mean age was 66.33 ± 11.75 years (range, 46 to 78 years).

The exclusion criteria of the study were; preoperative IOP 21 mmHg or above, previous ophthalmic surgery, history of uveitis or glaucoma, use of any drug likely to alter IOP or interact with apraclonidine and all patients with intraoperative complications. Also patients with neurosis or pulmonary, liver or renal disorders were not included in the study.

All patients underwent extracapsular cataract extraction with posterior chamber intraocular lens implantation. Preoperative medication included administration of eye drops of 1% cyclopentolate hydrochloride and 1% tropicamide one drop alternatively every ten minute one hour before surgery for dilating pupils. No patients received any preparations of noncorticosteroidal anti-inflammatory agents. Patients in the first group received one drop of 0.5 % apraclonidine and those in the second received one drop of 0.25% apraclonidine one hour before surgery. Control group received artificial tears at the same regimen. All operations were carried out under local anaesthesia using a modified O'Brien facial nerve block and retrobulbar block (max. 3 ml.) with an equal mixture of 2% lidocaine with epinephrine and 0.75% bupivacaine. Digital massage was applied until intraocular pressure by Schiötz tonometry was less than 10 mm Hg. A standard extracapsular cataract extraction was performed using balanced salt solution for irrigation. Intracameral sodium hyaluronate was used before anterior capsulotomy and intracocular lens

implantation, and was aspirated before final closure of the incision. Peripheral iridectomy or miotic intraocular injection were not performed to any case. Incision closure was performed with five to seven interrupted 10/0 nylon sutures. Subconjunctival gentamicin and dexamethasone were injected to all patients at the end of the procedure. Before patching, the first and second groups received one drop apraclonidine (0.5% and 0.25% respectively) and control group received artificial tears.

IOP was measured at 12th hour preoperatively and at 6th and 24th hours (early and late measurement) postoperatively. All the measurements were evaluated by the same surgeon using the same Goldmann applanation tonometer without surgeon's knowledge in which group the patient was.

When IOP was greater than 21 mm Hg or when the IOP rise was over 8 mm Hg from the initial measurement, this was considered to be intraocular hypertension.

Systolic and diastolic blood pressures and pulse rates were also recorded. Pupil diameter and interpupillary distance were measured under normal room illumination with caliper, and recorded. Pallor of the conjunctiva, xerostomia, dryness of nasal mucosa and exhaustion were asked, and recorded.

Results

Preoperative mean intraocular pressures were 13.66 ± 2.76 mmHg in the first group, 14.27 ± 2.24 mmHg in the second group and 14.5 ± 1.34 mmHg in the control group. Kruskal-Wallis analysis of variance was used to analyse mean intraocular pressure differences. There were no significant differences between preoperative mean IOP of the groups ($p=0.398$).

Mean IOP at the early postoperative visit (6th hour) was significantly lower in the first group (17.44 ± 4.95 mm Hg) when compared to the second group (21.78 ± 7.19 mm Hg) and the control group (24.55 ± 5.65 mm Hg). These results were evaluated with Kruskal-Wallis and Mann-Whitney tests ($p=0.000$).

Mean postoperative IOP at 24th was significantly lower in the first group (14.33 ± 3.75 mm Hg) when compared to the second group (17.11 ± 4.16 mm Hg) and the control group (19.61 ± 3.20 mm Hg) using Kruskal-Wallis and Mann-Whitney tests ($p=0.000$). These results are given in Figure 1.

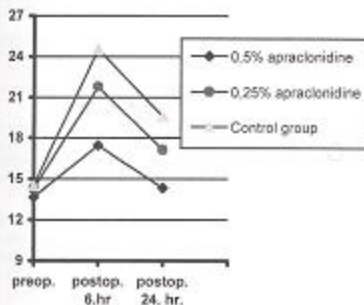


Figure 1. IOP change in the groups.

Statistical analysis to compare IOP among the initial, postoperative 6th and 24th hours measurements using Friedman test did not reveal significant differences in the first group ($p=0.104$). However, the postoperative 6th and 24th hours IOPs of the second group and the control groups were significantly greater than the preoperative IOPs ($p=0.002$, $p=0.000$ respectively).

Postoperative intraocular hypertension was presented in 3 cases (16.66%) at 6th hour and no patient at 24th hour measurements in the first group. In the second group 8 patients (44.44%) had postoperative intraocular hypertension at early phase and only 2 patients (11.11%) at late phase. However, these raised values were observed in 11 patients (61.11%) at 6th hour and in 6 patients (33.33%) at 24th hour measurements.

Side effects like bradycardia, rhythm disorders, sweating and exhaustion were not seen in all groups. Conjunctival blanching was seen in 5 eyes (27.77%) in the first group, in 3 eyes (16.66%) in the second group.

Discussion

Apraclonidine is a relatively selective alpha-2 agonist drug. It works peripherally and has limited effect on the central nervous system. Topical applications results in peripheral nonselective alpha agonistic properties such as unilateral transient eyelid retraction, conjunctival blanching and xerostomia (8). Blood pressure and heart rate were not affected significantly (9).

Apraclonidine reduces intraocular pressure by inhibiting aqueous humour production. The effect of apraclonidine on uveoscleral outflow is not known, and there appears to be no effect on

outflow facility, either (8). When given preoperatively, apraclonidine is effective in limiting the increase in IOP after argon laser trabeculoplasty, argon laser iridotomy and YAG laser posterior capsulotomy (10,11,12).

Prata reported the efficacy of topical apraclonidine 1% in controlling the early intraocular hypertension following cataract extraction (13). Wiles demonstrated that 1% apraclonidine given preoperatively minimizes the increases of IOP observed after cataract extraction, but it is ineffective when given postoperatively. Preoperative apraclonidine may stabilise the ciliary structure so that it reacts poorly to mediators released in response to surgery. Preoperative ciliary stabilisation appears to be necessary for early postoperative IOP to be controlled by apraclonidine (14).

1% apraclonidine has a peak effect at two to five hours after administration which coincides with the greatest rise of postoperative IOP and continues approximately 12 hours. It reduces IOP in normal and glaucomatous eyes. These characteristics of apraclonidine may explain efficacy in controlling the postoperative hypertension. Jampel suggested that lower concentrations may be as effective as 1% solution (9,15).

Several studies have confirmed that apraclonidine had no effect on cardiovascular system (8,9,15). However, there were systemic side effects in 30-50% of patients with transient dry nose and mouth (9,16). King reported that a patient had syncope and chest tightness 10 minutes after receiving one drop 1% apraclonidine (17). There were mild side effects such as conjunctival blanching with 0.25% and 0.50% apraclonidine in our study. We did not also see any systemic side effects such as systemic hypertension, change in pulse rate, dryness of mouth and nasal mucosae or exhaustion. However, it should be forgotten that we excluded patients having hypertension, pulmonary disease and neurosis. In the patients having these diseases, one should consider that systemic side effects can apparently occur as a result of 1% apraclonidine at the time of cataract surgery or later.

In the study, postoperative intraocular hypertension presented in 3 cases (16.66%) at 6th hour and in no patient at 24th hour measurements in the first group. On the other hand, there were insignificant differences between preoperative, 6th and 24th IOP measurements in the rest of the cases. In the second group 8 patients (44.44%)

had postoperative intraocular hypertension at early phase and only 2 patients (11.1%) at late phase. However, the postoperative 6th and 24th hours IOPs of the second group were significantly greater than the preoperative IOP ($p=0.002$).

Our study demonstrated that topical 0.50% apraclonidine is effective for controlling early postoperative intraocular hypertension after cataract extraction without any side effects while 0.25 % apraclonidine lacked the same effectiveness. 0.50% apraclonidine can be alternative drug to 1 % apraclonidine for having no side effects and cost effective.

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