

Efficacy of anterior chamber paracentesis after intravitreal triamcinolone injection

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PURPOSE. To investigate the efficacy of anterior chamber paracentesis for intravitreal triamcinolone acetonide injection (IVTA).

METHODS. A prospective, randomized clinical trial was conducted on 30 eyes from 30 patients scheduled for IVTA (4 mg/0.1 mL). Eyes were randomly divided into two groups: eyes that had undergone anterior chamber paracentesis (Group 1, 15 eyes) and eyes that did not have anterior chamber paracentesis (Group 2, 15 eyes). Intraocular pressure (IOP) was measured by Goldmann applanation tonometry at a baseline of 2, 15, 30, and 60 minutes at 1 day and 1 week after the injection. The authors analyzed the short-term postoperative changes of the IOP in each group.

RESULTS. For Group 1, the mean preoperative IOP was 15.33 ± 1.72 mmHg, and the postoperative IOP at 2 and 15 minutes were 7.80 ± 1.47 and 11.73 ± 1.67 mmHg, respectively. For Group 2, there was a significant elevation of IOP (46.73 ± 8.26 mmHg) 2 minutes after the injection, which decreased to the normal range (16.13 ± 2.61 mmHg) by 15 minutes after the injection. There were no significant differences between the two groups in IOP at 15 minutes postsurgery compared with the distinct difference in IOP at 2 minutes post surgery (Student t-test, $p=0.01$).

CONCLUSIONS. The findings suggest that routine anterior chamber paracentesis is inappropriate due to the brief immediate postoperative IOP elevation with IVTA. (Eur J Ophthalmol 2007; 17: 776-9)

KEY WORDS. Intraocular pressure, Intravitreal injection, Paracentesis

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INTRODUCTION

Intravitreal triamcinolone acetonide injection (IVTA) is a widely performed procedure for the treatment of intraocular neovascular disease due to exudative age-related macular degeneration (1-3) as well as macular edema secondary to diabetes mellitus (4, 5), retinal vein occlusion (6, 7), uveitis (8), and in other clinical disorders of the eye (9, 10). IVTA is a relatively simple technique performed in an operating room or in the outpatient setting; the widely performed technique is a 4 mg/0.1 cc injection through the pars plana. At the time of the injection, anterior chamber paracentesis is at times performed to prevent increase in intraocular pressure (IOP). However, some clinicians claim that paracentesis is not necessary, because the increase in IOP is

temporary and occurs for only a short period of time after which it returns to normal (11).

Therefore, we investigated the degree and the duration of IOP increase immediately after IVTA and compared the results with a group that had paracentesis to determine the efficacy of paracentesis.

METHODS

We recruited consecutive patients with macular edema undergoing IVTA in a prospective, randomized fashion. Patients with a prior diagnosis of glaucoma, a previous history of vitrectomy surgery, use of IOP-lowering agents, or baseline IOP ≥ 21 mmHg were excluded.

The study was approved by the institutional review board Human Research Ethics Committee of our institution, and all patients completed written informed consent. Patients were enrolled over a 9-month interval. The total sample size was set at 30 eyes, and divided into two groups: Group 1 (15 eyes) had a paracentesis performed and Group 2 (15 eyes) did not have a paracentesis.

Prior to starting the study a computer-generated list with random but equal distribution of the two variables was constructed. Patients scheduled for IVTA were assigned to a group according to the protocol. Informed consent was obtained from each patient at least 3 days before surgery. The nature of the specific procedure was explained in detail and alternatives were outlined.

Topical antibiotics, 0.3% ofloxacin (Tarivid®, Santen Inc., Japan), were applied four times a day starting the day before the injection; the IOP was measured using the Goldmann applanation tonometer before the injection. The operation was performed by one surgeon (W.C.). Topical anesthetic application of 0.5% proparacaine hydrochloride (Alcaine®, Alcon laboratories Inc.) was administered five times within a 2-minute interval. After sterilizing the periorcular area with 5% povidone iodine, we waited 30 seconds, then, after carefully washing the eye with balanced salt solution, and injecting triamcinolone acetonide (Triam., Sinpung Medicals, Korea) suspension of 4 mg/0.1 cc using a 30 gauge needle at the inferotemporal site, 3.5 mm from the limbus in a phakic eye and 3.0 mm from the limbus in a pseudophakic eye, we pressed the injection site for 10 seconds with a swab. The injection was performed perpendicular to the sclera without changing the direction of needle after penetrating the conjunctiva and some reflux was noted immediately after injection in all cases. In Group 1, aqueous of about 0.05 cc was drained after IVTA using a 30 gauge needle. Additional eyedrop, with 0.3% ofloxacin, was applied in both groups for 3 days after the operation.

IOP using the Goldmann applanation tonometer was measured in all patients at 2, 15, 30, and 60 minutes and at 1 day and 1 week after the injection.

Statistical analysis

A statistical analysis was performed using the Student *t*-test for comparing changes in IOP between the two groups according to each period of time, and changes in the preoperative and postoperative IOP were analyzed using the paired *t*-test.

RESULTS

Group 1 had 5 males and 10 females, and Group 2, 7 males and 8 females. The mean age of the patients in Group 1 was 63.7 years and in Group 2 was 61.9 years, showing a relatively even distribution ($p>0.05$). There was one pseudophakic eye in Group 1 and two pseudophakic eyes in Group 2. The most common cause of macular edema was diabetes mellitus in both groups (Tab. I).

The mean IOP for Group 1 measured before IVTA was 15.33 ± 1.72 mmHg, and at 2 minutes after IVTA was 7.80 ± 1.47 mmHg (6~11 mmHg), demonstrating a significant reduction in IOP ($p<0.05$). IOP measured 15 minutes after IVTA was 11.73 ± 1.67 mmHg and at 30 minutes after the operation was 13.00 ± 1.81 mmHg; these findings show that IOP tends to slowly increase after the procedure and this trend continued until 1 week after the IVTA. For Group 2, the preoperative mean IOP was 14.60 ± 2.67 mmHg; however, the IOP at 2 minutes post surgery demonstrated a rapid increase ($p<0.05$), 46.73 ± 8.26 mmHg (34~65 mmHg); IOP at 15 and 30 minutes post surgery decreased

TABLE I - DISTRIBUTION OF INDICATIONS FOR INTRAVITREAL TRIAMCINOLONE INJECTION IN EACH GROUP

| | Group 1 | Group 2 |
|----------------------------------|---------|---------|
| Diabetic macular edema | 11 | 6 |
| Retinal vein occlusion | 4 | 6 |
| Uveitis | 0 | 2 |
| Age-related macular degeneration | 0 | 1 |

TABLE II - POSTOPERATIVE INTRAOCULAR PRESSURE (IOP) CHANGE IN EACH GROUP

| | IOP (mmHg) | |
|-------------------|-------------------|--------------------|
| | Group 1 | Group 2 |
| Preoperative IOP | 15.33 ± 1.72 | 14.60 ± 2.67 |
| Postoperative IOP | | |
| 2 min | $7.80 \pm 1.47^*$ | $46.73 \pm 8.26^*$ |
| 15 min | 11.73 ± 1.67 | 16.13 ± 2.6 |
| 30 min | 13.00 ± 1.81 | 15.53 ± 2.10 |
| 1 h | 14.07 ± 2.23 | 15.93 ± 3.88 |
| 1 d | 15.93 ± 2.74 | 14.87 ± 2.45 |
| 1 wk | 16.87 ± 2.13 | 15.20 ± 2.01 |

*Student *t*-test, $p=0.01$

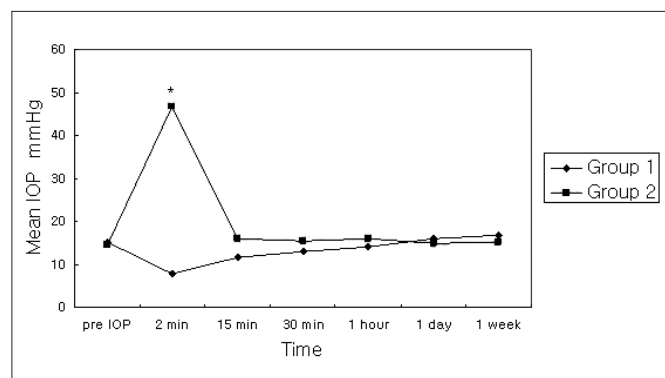


Fig. 1 - Serial change of the mean intraocular pressure (IOP) in each group. *The only statistical difference point between two groups ($p=0.01$; Student *t*-test).

to 16.13 ± 2.61 mmHg and 15.53 ± 2.10 mmHg, respectively (Tab. II). A significant difference was found at 2 minutes postinjection in comparisons of the IOP between the two groups (Student *t*-test, $p=0.01$) (Fig. 1).

A very mild inflammatory reaction was observed within 1 hour after injection in the anterior chamber of five eyes (33%) in Group 1, while no significant inflammatory reactions were observed in Group 2. No serious complications such as vitreous hemorrhage, retinal detachment, or endophthalmitis were observed during the follow-up period of 2 months after IVTA in either of the two groups.

DISCUSSION

Anterior chamber paracentesis has been performed to prevent ischemia of the optic nerve which can result from intravitreal gas injection or a temporary rise in IOP after a scleral buckling procedure (12). Similarly, paracentesis has been performed as part of IVTA to prevent an elevation of IOP due to increases in ocular capacity after the injection. Paracentesis is a simple technique that is generally not accompanied by complications. However, increases in prostaglandin E_2 in the aqueous humor, as a result of a breakdown of the blood-aqueous barrier in the ciliary process, cause an increase in protein, vascular congestion, miosis, and a temporary rise in IOP due to the increased vascular permeability (13, 14). There have been reports of serious complications associated with paracentesis including hyphema, cataract due to damage to iris and lens, keratitis, corneal abscess, minimal stromal opacity, and endophthalmitis (15-18).

In Group 1 after IVTA, the IOP increased from an average

of 7.80 ± 1.47 mmHg at 2 minutes post surgery to 11.73 ± 1.67 mmHg at 15 minutes post surgery; thus an IOP falling effect, due to paracentesis, was temporal; after which a gradual increase in the IOP was observed and the IOP at 1 week post surgery was a little higher than the preoperative IOP. For Group 2, the immediate rise in IOP, due to increase in the ocular capacity immediately after IVTA, was normalized within 15 minutes; the normalization resulted from reduction of aqueous formation and an increase in aqueous outflow due to the high IOP immediately after surgery.

The most serious complication following IVTA is acute endophthalmitis; it generally appears 1 to 15 days after the injection and commonly presents with iritis, hypopyon, ocular pain, red eye, and decreased vision (19). Iritis appeared in the early period after the injection in Group 1 (five eyes); therefore, paracentesis may complicate the detection of early stage endophthalmitis.

When performing intravitreal injection, the rise in IOP occurs as a result of increase in the intravitreal capacity after surgery. However, the results of our study showed that the increase in IOP did not continue for more than 15 minutes. Even if the risk for optic nerve damage is high, because of underlying disease, the exposure to the rise in IOP is very short and the perfusion pressure is maintained by autoregulation; therefore, it is predicted that hypoxia of the optic nerve and retina, and damage to the optic nerve due to reduction of blood flow rate, is unlikely. Aiello et al (11) reported that prophylactic or postinjection paracentesis with intravitreal injection is not the best technique for preventing a temporal rise in IOP, that it is more important to monitor the IOP and identify postinjection reperfusion of the optic nerve than to perform a routine paracentesis. Although paracentesis is simple to perform and can induce immediate fall in IOP it has been associated with serious complications and it adds time to the IVTA procedure. Therefore, we conclude that when performing IVTA routine anterior chamber paracentesis does not appear to be indicated.

Proprietary interest: None.

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