Original Article

Control of Raised Intraocular Pressure after Intravitreal Triamcinolone Acetonide

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Purpose: To determine the various treatment options including anti-glaucoma medication, laser and surgery to control the intraocular pressure (IOP) rise after Intravitreal triamcinolone acetonide (IVTA).

Material and Methods: This prospective, interventional case series was carried out at Isra Postgraduate Institute of Ophthalmology, Karachi from May 2007 to April 2009. Patients with various choroidal and retinal vascular disorders, who were given IVTA in a dose of 4 mg / 0.1 ml and developed raised IOP (> 21 mm Hg) were included in the study and followed up for one year.

Results: Two hundred thirty seven eyes of 180 patients received IVTA during the study period. The mean age of patients was 50.86 ± 10.62 years with gender distribution of 99 male and 81 female. One hundred seventeen (49.36%) out of 237 eyes showed raised IOP after IVTA. Fifty two (21.94%) eyes showed an IOP between 25-30 mmHg while 65 (27.42%) had IOP of > 30 mm Hg. Successful control of IOP was defined as an IOP of less than 21 mm Hg. Thirty-four (29.05%) eyes were controlled with single beta-blocker therapy (Timolol maleate 0.5%) and 69 (58.97%) eyes were brought into control with combination therapy (Timolol maleate 0.5% + Dorzolamide 2%). Additional 4 (3.41%) eyes required Prostaglandin analogue (Latanoprost 0.005%) along with combination therapy for IOP control. Another 4 (3.41%) eyes were controlled with Argon laser trabeculoplasty and full medical treatment and remaining 6 (5.12%) eyes settled down with trabeculectomy with adjunctive mitomycin-C.

Conclusion: Although IVTA is a cost-effective therapeutic agent against various choroidal and retinal disorders, 50% of the patients developed raised IOP > 21 mm Hg. Half of these patients required multiple drugs and almost 5% needed surgical intervention to control IOP under 21 mm Hg.

Key words: Triamcinolone acetonide, Intraocular pressure, Glaucoma.

Triamcinolone acetonide is a major therapeutic agent given intravitrealy in various retinal and choroidal vascular disorders.[1-7] The raised intraocular pressure (IOP) is a major concern of this procedure. The reported incidence of increase in IOP varies from 27-50% in various studies published in literature.[8-12] Intravitreal triamcinolone acetonide (IVTA) causes secondary open angle type of glaucoma. The exact mechanism of rise in IOP is not known but it can be caused by cortisone crystals blocking the trabecular meshwork or steroid related decreased phagocytosis of extracellular matrix in meshwork by macrophages. Corticosteroids are believed to decrease aqueous outflow by inhibiting degradation of extracellular matrix material in trabecular meshwork, leading to an excessive amount of debris within the outflow channels with subsequent increase in outflow resistance.[13,14] Steroid induced glaucoma after IVTA is usually of transient nature but can run a chronic course in certain patients. Patients having IOP of more than 16 mm Hg, with family history of glaucoma or having diabetes mellitus are at increased risk of developing full – fledged disease[15, 16]. An increase in IOP after IVTA may take up to six

months to present[12]. The rise in IOP can be variable after IVTA, ranging from 22 mm Hg to more than 40 mmHg, failing to control with medical therapy and eventually requiring drainage surgery.

We undertook this study to determine the various treatment options and their effectiveness in controlling IOP in cohort of patients who received IVTA because of their choroidal and retinal vascular problems and developed raised IOP > 25 mm Hg.

MATERIAL AND METHODS

This was a prospective interventional case series conducted at Isra Postgraduate Institute of Ophthalmology/Al-Ibrahim Eye Hospital, Karachi. Permission to conduct the research was taken by the ethics committee of the Hospital. The study design and details of the procedures are described elsewhere[12]. Briefly, 237 eyes of 180 patients received IVTA (4 mg / 0.1 ml) from May 2007 to April 2009 with various choroidal and retinal vascular disorders (Table 1). Patients having IOP of > 20mm Hg and already receiving anti-glaucoma medication were excluded from the study.

After informed consent, a detailed ocular examination was carried out, including best corrected visual acuity, anterior segment biomicroscopy, IOP measurement, gonioscopy and fundus examination using +90 DS lens.

All intravitreal injections were given under sterile conditions in operating theatre with patients receiving ciprofloxacin 0.3% drops (Ciloxin – Alcon, Belgium) one day prior to injection and continuing for 3 days afterwards. All patients were followed at day 1, 1 week, 1 month, 3 months and 6 months subsequently with mean follow up of one year. At each follow up visit, patients had charting of vision, IOP measurement and fundus examination.

A major aim of this study was to determine the proportion of eyes that had uncontrolled IOP (> 21 mm Hg) after the injection and the type and effectiveness of the IOP – lowering treatment they received.

The rise in IOP was noticed at 1 week of post injection period but peaked to highest level at 3 months and continued to show an increase up to 6 months.

Statistical analysis

For data analysis, SPSS (Statistical Package for Social Sciences) version 17.0 was used. The frequency and percentages were computed for categorical variables including gender and diagnosis. For continuous variable IOP, data was shown in mean ± standard deviation.

RESULTS

Two hundred thirty seven eyes of 180 patients received IVTA during the study period. The mean age of patients was 50.86 ± 10.62 years with gender distribution of 99 male and 81 female. Out of 237 eyes, 117 (49.36%) eyes showed an increase in IOP > 21 mmHg (Fig. 1). The IOP increased from 13.76 ± 2.79 mmHg to a mean of 15.73 ± 4.5 mm Hg post injection after 1 week. At 1 month, IOP was increased to 17.3 ± 6.8 mm Hg. After 3 months, IOP increased to 19.08 ± 8.6 mm Hg and after 6 months IOP was 14.38 ± 4.9 mm Hg ($p < 0.0001$). Fifty two (21.94%) eyes showed an IOP of 21-30 mm Hg. All these eyes were commenced on Timolol maleate 0.5% (Betalol – Sante, Pak), one drop twice a day. Thirty four (14.34%) eyes had controlled IOP < 21 mm Hg, while 18 (7.59%) eyes still had uncontrolled eye pressure.

Table 1: Distribution of patients according to the diagnosis (n = 180)

Diagnosis	Number of Patients
Diabetic macular edema	68 (75.6%)
Neovascular age related macular degeneration	12 (13.3%)
Branch retinal vein occlusion	40 (44.4%)
Central retinal vein occlusion	36 (40%)
Posterior uveitis	23 (26.7%)

Data shown in frequencies and percentages n (%).

Sixty five (27.42%) eyes out of 117 eyes had an initial IOP measured > 30 mm Hg. These eyes along with 18 eyes not controlled on single beta blocker therapy (65 + 18 = 83 eyes) were initiated on combination therapy of Timolol maleate 0.5% + Dorzolamide 2% (Co-dorzal – Sante, Pak). Out of total 85 eyes, 69 (29.11%) eyes responded well on combination therapy bringing IOP < 21 mm Hg while 14 eyes (5.90%) still had an elevated IOP of > 25 mm Hg. Four (1.68%) eyes had a further drop in IOP < 21 mm Hg with addition of Latanoprost 0.005% (Vislat – Sante, Pak). Out of remaining 10 (4.21%) eyes, Argon

Table 2: Various treatment options in patients with raised IOP after intravitreal triamcinolone acetonide (n = 117 eyes).

Treatment	No. of Eyes	Controlled	Uncontrolled
Timolol maleate 0.5%	52	34	18
Timolol maleate 0.5% + Dorzolamide 2%	83 (65 + 18)	69	14
Timolol maleate 0.5% + Dorzolamide 2% + Latanoprost 0.005%	14	04	10
Timolol maleate 0.5% + Dorzolamide 2% + Latanoprost 0.005% + ALT*	10	04	06
Trabeculectomy + MMC***	06	06	00

laser trabeculoplasty (ALT) was performed, controlling IOP in further 4 (1.68%) eyes. The remaining 6 (2.53%) eyes with uncontrolled IOP of > 25 mm Hg with combination therapy, prostaglandin analogue and ALT were subjected to trabeculectomy with adjunctive use of mitomycin-C. All these eyes remained within range of normal IOP between 10-20 mmHg at mean follow up of one year (Table 2).

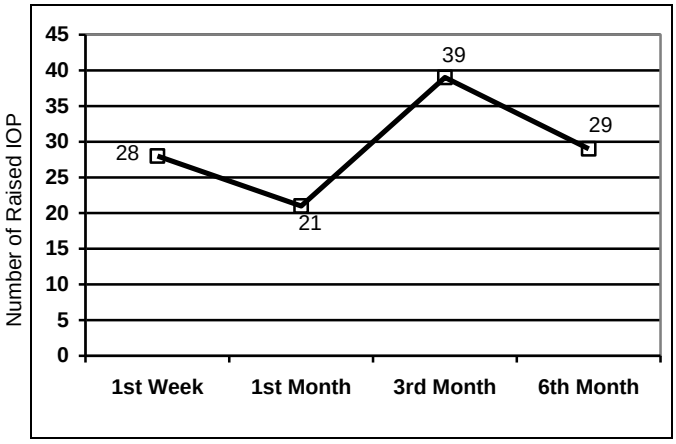

Fig. 1: Raised IOP in total number of eyes following intravitreal triamcinolone acetonide. Total eyes 237, raised IOP in 117 (49%) eyes.

In essence, out of 117 eyes showing raised IOP after IVTA, 34 (29.05%) eyes were controlled with single beta-blocker therapy, 69 (58.97%) eyes were brought into control with combination therapy. Additional 4 (3.41%) eyes required Prostaglandin analogue along with combination therapy for IOP control. Another 4 (3.41%) eyes were controlled with ALT and full medical treatment and remaining 6 (5.12%) eyes settled down with drainage surgery.

DISCUSSION

Intravitreal triamcinolone acetonide (IVTA) can be a therapeutically option for the treatment of various intraocular pathologies including neovascular, oedematous and proliferative disease involving choroid and retina. It can also be used as an angiostatic agent in eyes with iris neovascularization, proliferative diabetic retinopathy and Wet age related macular degeneration. An increase in IOP is a common side effect with the use of IVTA. The rise in IOP can occur from one week to 6 months post injection. The amount of IOP increase can range from 22-40 mm Hg. (The raise in IOP can be between 22 and 40 mm Hg) There are certain number of patients who cannot be controlled on medical therapy and go on to have drainage surgery. An IOP elevation after IVTA was reported in 40% of 305 eyes by Jonas and coworkers[17]. Thirty nine percent of these eyes were controlled below 21 mm Hg on topical anti-glaucoma medication and systemic carbonic anhydrase inhibitors with 1% (03) eyes required drainage surgery. Kocaboraet al[8] reported 40 (27%) eyes out of 147 eyes, showing an increase in IOP of > 25 mm Hg after IVTA. Thirty – three (22.44%) eyes were controlled below 21 mm Hg on combination treatment of Timolol maleate and Dorzolamide drops, while 7 (4.7%) eyes required drainage surgery. Park[10] and colleagues reported 26, out of 60 (43.3%) eyes having elevated IOP after 4mg of IVTA. Intraocular pressure was not controlled despite full anti-glaucoma medication in 7 (11.7%) eyes. These eyes underwent filtering surgery. In another study Bashshur[18] reported 59 (26.1%) of 226 eyes having IOP higher than 21 mm Hg after IVTA in 4mg dosage. Fifteen eyes (6.63%) had IOP of > 25 mm Hg treated with combination therapy of Dorzolamide and Timolol maleate, while 3 (1.32%)

eyes required surgery.

Compared to these studies, in our cohort of patients receiving IVTA, 117 out of 237 eyes showed raised IOP of > 21 mm Hg. Out of these, 34 (29.05%) eyes were controlled with single beta-blocker, 69 (58.97%) eyes were brought in to control with combination therapy, while 4 (3.41%) eyes required Prostaglandin analogue along with combination therapy for IOP control. Another 4 (3.41%) eyes were controlled with additional ALT and remaining 6 (5.12%) eyes settled down with drainage surgery.

Severe and intractable IOP elevation can occur even with full medical treatment after IVTA, with certain patients necessitating trabeculectomy. This, therefore requires careful indication of IVTA and long follow up.

CONCLUSION

The benefit of intravitreal triamcinolone acetonide therapy should be weighed against the risk of increased IOP, as 50% of our patient receiving IVTA developed raised IOP > 21 mm Hg. Half of these patients required multiple drugs and almost 5% needed drainage surgery to control IOP.

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REFERENCES

1. **Karacorlu M, Ozdemir H, Karacorlu S, Alacali N, Mudun B, BurumcekE.** Intravitreal triamcinolone as a primary therapy in diabetic macular oedema. Eye 2004; 19: 382-6.
2. **Hayashi K, Hayashi H.** Intravitreal versus retrobulbar injections of triamcinolone for macular edema associated with branch retina vein occlusion. Am J Ophthalmol. 2005; 139: 972-82.
3. **Williamson TH, O'donnelA.** Intravitreal triamcinolone acetonide for cystoid macular edema in nonischemic central retinal vein occlusion. Am J Ophthalmol. 2005; 139: 860-6.
4. **Park CH, Jaffe GJ, Fekrat S.** Intravitreal triamcinolone acetonide in eyes with cystoid macular edema associated with central vein occlusion. Am J Ophthalmol. 2003; 136: 419-25.
5. **Martidis A, Duker JS, Greenberg PB, Rogers AH, Puliafito CA, Reichel E, BaumalC.** Intravitreal Triamcinolone for refractory diabetic macular edema. Ophthalmology. 2002; 109: 920-927.
6. **Jonas JB, Kreissig I, Hugger P, Sauder G, Panad-Jonas S, Degenring R.** Intravitreal triamcinolone for exudative age related macular degeneration. Br J Ophthalmol. 2003; 87: 462-8.
7. **Rechtman E, Danis RP, Pratt LM, Harris A.** Intravitreal triamcinolone with photodynamic therapy for subfovealchoroidal neovascularization in age related macular degeneration. Br J Ophthalmol. 2004; 88: 344-7.
8. **Kocabora MS, Yilmazli C, Taskapili M, Gulkilik G, Durmaz S.** Development of ocular hypertension and persistent glaucoma after intravitreal injection of triamcinolone. Cl Ophthalmol 2008; 2: 167-71.
9. **Jonas JB, Degenring RF, Kreissig I, Akkoyun I, Kamppler BA.** Intraocular pressure elevation after intravitreal triamcinolone acetonide injection. Ophthalmology. 2005; 112: 593-98.
10. **Park HY, Yi K, Kim HK.** Intraocular pressure elevation after intravitreal triamcinolone acetonide injection. Korean J Ophthalmol. 2005; 19: 122-7.
11. **Jonas JB, Kreissig I, Degenring R.** Intraocular pressure after intravitreal injection of triamcinolone acetonide. Br J Ophthalmol. 2003; 87: 24-7.
12. **Mahar PS, Memon AS.** Frequency and management of raised intraocular pressure following intravitreal triamcinolone acetonide. JCPSP 2012; 22 (11): 699-702.
13. **Renfro L, Snow JS.** Ocular effects of topical and systemic steroids. DermatolCli. 1992; 10: 505-10.
14. **Wordinger RJ, Clark AF.** Effect of glucocorticoids on the trabecular meshwork: towards a better understanding of glaucoma. Prog Retina Eye Res. 1999; 18: 629-67.
15. **Rhee DJ, Peck RE, Belmont J, Martidis A, Liu M, Chang J et al.** IOP alterations following intrvitreal triamcinolone acetonide. Br J Ophthalmol. 2006; 90: 999-1003.
16. **Chang YC, Wu W.** Elevation of IOP after intravitreal injection of triamcinolone acetonide in Taiwanese patients. Kaohsiung J Med Sci. 2008; 24: 27-7.
17. **Jonas JB, Degenring RF, Kreissig I, Akkoyum I, Kamppeter BA.** Intraocular pressure elevation after Intravitreal triamcinolone acetonide injection. Ophthalmology. 2005; 112: 593-8.
18. **Bashshur ZF, Terro AM, El-Haibi CP, Halawi AM, Schakal A, Noureddin BN.** Intravitreal triamcinolone acetonide: pattern of secondary IOP rise and possible risk factors. Clin Ophthalmol. 2008; 2: 269-74.