Control of Raised Intraocular Pressure after Intravitreal Triamcinolone Acetonide

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Pak J Ophthalmol 2014, Vol. 30 No. 3

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 disease15,16. An increase in IOP after IVTA may take up to six
months to present. 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. 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: Distribution of patients according to the diagnosis (n = 180)](image)

Data shown in frequencies and percentages n (%).

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.

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
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).

**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. 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. Kocabora et al 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 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 reported 59 (26.1%) of 226 eyes having IOP higher than 21 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.

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

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. of Eyes</th>
<th>Controlled</th>
<th>Uncontrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timolol maleate 0.5%</td>
<td>52</td>
<td>34</td>
<td>18</td>
</tr>
<tr>
<td>Timolol maleate 0.5% + Dorzolamide 2%</td>
<td>83 (65 + 18)</td>
<td>69</td>
<td>14</td>
</tr>
<tr>
<td>Timolol maleate 0.5% + Dorzolamide 2% + Latanoprost 0.005%</td>
<td>14</td>
<td>04</td>
<td>10</td>
</tr>
<tr>
<td>Timolol maleate 0.5% + Dorzolamide 2% + Latanoprost 0.005% + ALT*</td>
<td>10</td>
<td>04</td>
<td>06</td>
</tr>
<tr>
<td>Trabeculectomy + MMC***</td>
<td>06</td>
<td>06</td>
<td>00</td>
</tr>
</tbody>
</table>

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