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Prospective evaluation of intravitreal triamcinolone acetonide injection in macular edema associated with retinal vascular disorders

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PURPOSE. To evaluate the effect of intravitreal triamcinolone acetonide on visual acuity and macular thickness using optical coherence tomography (OCT) in macular edema associated with various retinal vascular disorders.

METHODS. This prospective nonrandomized clinical interventional study included 81 eyes (76 patients) comprised of Group I, 57 eyes (51 patients) with diabetic macular edema; Group II, 10 eyes (10 patients) with branch retinal vein occlusion; and Group III, 13 eyes (13 patients) with central retinal vein occlusion. All eyes received an intravitreal injection of 4 mg triamcinolone acetonide (with the solvent) in the operation theater under sterile conditions.

RESULTS. Mean preinjection central macular thickness was 531.84±132 µm in Group I, 458.4±149 µm in Group II, and 750.81±148 µm in Group III. All groups showed a statistically significant decrease in mean central macular thickness at 1 month (300.7±119 µm in Group I, 218.2±99 µm in Group II, and 210.5 ±56 µm in Group III) and 3 months (253.19±109 µm in Group I, 187±47 µm in Group II, and 182±50 µm in Group III) after injection ($p<0.05$). Mean follow-up was 22±2.4 weeks. Mean visual acuity increased in all three groups (preoperative visual acuity in Group I, 1.2±0.4 logMAR units; Group II, 1.24±0.5 logMAR units; Group III, 1.1±0.4 logMAR units; 1 month postinjection in Group I, 0.88±0.3 logMAR units; Group II, 0.67±0.3 logMAR units; Group III, 0.86±0.4 logMAR units; 3 months postinjection in Group I, 0.84±0.4 logMAR units; Group II, 0.59±0.3 logMAR units; Group III, 0.82±0.5 logMAR units) ($p<0.05$). Forty-one eyes completed 6 months and 20 eyes completed 9 months follow-up. Twelve of 20 (41%) eyes in Group I, 2/6 (33%) eyes in Group II, 3/6 (50%) eyes in Group III, and 8/15 (53%) eyes in Group I, 1/3 (33%) eyes in Group II, and 2/2 (100%) eyes in Group III developed recurrence of macular edema with worsening of visual acuity at 6 and 9 months, respectively. Thirty-three (40.7%) eyes developed IOP elevation (at least one reading > 24 mmHg). One eye developed infective endophthalmitis.

CONCLUSIONS. Intravitreal injection of triamcinolone acetonide may be considered as an effective treatment for reducing macular thickening due to diffuse diabetic macular edema, venous occlusion associated macular edema, and may result in increase in visual acuity at least in the short term. Further follow-up and analysis is required to demonstrate its long-term efficacy. (Eur J Ophthalmol 2005; 15: 619-26)

KEY WORDS. Intravitreal triamcinolone acetonide, Diabetic macular edema, Central retinal vein occlusion, Branch retinal vein occlusion

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INTRODUCTION

Macular edema is a common cause of central vision loss in various retinal vascular disorders such as diabetic retinopathy and retinal vein occlusions (1-3). The initial treatment guidelines of macular edema associated with diabetes and vascular occlusion include focal or grid photocoagulation, which is usually practiced as per the recommendation of various study groups (Early Treatment Diabetic Retinopathy Study [ETDRS] group, branch vein occlusion study group, and central vein occlusion study group) (4-6). Despite adequate photocoagulation many patients may have persistent macular edema (7, 8). Various alternative treatment options such as pars plana vitrectomy and pharmacologic therapy with protein kinase C inhibitor have been tried in eyes in which laser photocoagulation has failed (9, 10).

In recent years there have been many reports in the literature suggesting the use of intravitreal triamcinolone acetonide for a wide variety of types of macular edema (11-19). Intravitreal triamcinolone acetonide is well tolerated and has been shown to be nontoxic to the human retina (20-22). We conducted a prospective study to evaluate the safety and efficacy of intravitreal triamcinolone acetonide in macular edema associated with diabetes and retinal vein occlusions.

METHODS

Eighty-one eyes of 76 patients (57 eyes of 51 patients with diabetes mellitus, Group I; 10 eyes with branch retinal vein occlusion, (BRVO), Group II; and 13 eyes with central retinal vein occlusion (CRVO), Group III) were included in this prospective study (November 2003–June 2004). Informed consent was obtained from all the patients and they were informed about the risks and benefits and experimental nature of the therapy. All patients underwent a detailed ophthalmic examination including a record of best-corrected visual acuity (BCVA) with ETDRS charts, slit-lamp biomicroscopy, fundus examination with +90 D, and applanation tonometry. Fundus fluorescein angiography was performed prior to injection and whenever indicated after the injection. Optical coherence tomography (OCT) measurements were performed to record the macular thickness, following pupillary dilation of at least 5 mm and with internal fixation target. Macular thickness map scan protocol was used, which included six radial line scans of 6 mm length placed 30º to each other and passing through a common central axis centered on the fovea. For inclusion in the study all the eyes had a BCVA of less than 0.5 logMAR units on ETDRS chart, intraocular pressure (IOP) less than 21 mmHg, and a central macular thickness of at least 300 µm on OCT (normal, 181.15±18 µm). All patients with diabetes had received at least two sessions of laser photocoagulation using the ETDRS guidelines at least 3 months prior to injection. Patients with history of ocular hypertension or glaucoma were excluded.

All injections were performed under sterile conditions in the main operation theater. A superpinkie was applied for 10 minutes prior to the injection to lower the IOP. Paracain 0.5% eyedrop was used to anesthetize the conjunctival sac. The eye was prepared with 5% povidone-iodine and draped. A sterile wire speculum was placed. A new sterile bottle of triamcinolone acetonide (40 mg/mL, Tricort 40,

TABLE I - CENTRAL MACULAR THICKNESS ON OPTICAL COHERENCE TOMOGRAPHY AND VISUAL ACUITY (VA) IN DIABETIC MACULAR EDEMA BEFORE AND AFTER INTRAVITREAL TRIAMCINOLONE INJECTION

Visit	Mean CMT* (µm)	Minimum (µm)	Maximum (µm)	% Reduction†	VA‡	Difference in VA§
Baseline	531.84±232.3	308	980	–	1.20±0.4	–
Day 1¶	402.71±161.3	184	809	24	1.11±0.4	0.13±0.2
Week 1¶	331.82±114.2	170	707	37.17	0.93±0.3	0.24±0.3
Month 1¶	300.69±119.8	132	681	43.62	0.88±0.3	0.30±0.3
Month 3¶	253.19±109.4	140	619	52.39	0.84±0.4	0.25±0.3

*Central macular thickness (CMT) ± standard deviation
†% Reduction from the baseline CMT
‡ Visual acuity in logMAR units ± standard deviation
§Paired difference in visual acuity from baseline in logMAR units ± standard deviation
¶Postinjection follow-up visit

benzyl alcohol 0.9% as preservative, Cadila Pharmaceutical Ltd., Ahmedabad, India) was used for each eye. The suspension was shaken well before loading. The drug (4 mg in 0.1 mL) was injected with the solvent inferotemporally through pars plana with a 1-mL syringe fitted with 26-gauge needle. IOP was checked immediately after the injection. An anterior chamber (AC) paracentesis was performed if the IOP exceeded 24 mmHg. The paracentesis was performed temporally along the horizontal meridian using a 26-gauge needle fitted on a 2 cc glass syringe without the plunger. Twenty-three (28%) eyes required paracentesis. Indirect ophthalmoscopy was performed in each case after the procedure to confirm proper intravitreal localization of the drug and perfusion of the optic nerve head. Antibiotic eyedrop (ciprofloxacin 0.3%) was instilled at the end. The patient was instructed to instill ciprofloxacin 0.3% eyedrop for 4 days following injection.

All the patients were followed up 1 day, 1 week, 1 month, 3 months, 6 months, and 9 months postinjection. At each follow-up visit response to the treatment was monitored by recording the ETDRS visual acuity, IOP, and macular thickness on OCT. Indirect ophthalmoscopy was performed to check for the presence of the drug suspension. Eyes were also observed for injection-related complications. Statistical analysis was performed using SAS commercial statistical software package (SAS Institute, Inc., Cary, NC). One-way analysis of variance for repeated measures was used to compare the change in macular thickness and visual acuity following injection. A p value < 0.05 was considered statistically significant.

All the eyes completed 3 months follow-up and 29 eyes in Group I, 6 eyes in Group II, and 6 eyes in Group III completed 6 months of follow-up; 15 eyes in Group I, 3 eyes in Group II, and 2 eyes in Group III completed 9 months of follow-up.

RESULTS

The mean age of our patients was 58±11.20 years, with 59 men and 17 women. Nine eyes were pseudophakic. The dose of triamcinolone injected was 4 mg in all eyes.

In Group I mean duration of diabetes was 12.58±3.44 years, and average number of prior photocoagulation sessions received was 2.36±0.6. Mean preinjection visual acuity was 1.2±0.4 logMAR units (range 0.60–1.7). Baseline central macular thickness on OCT was 531.84±132 µm (range 308–980 µm). A 43.62% reduction in mean central macular thickness (from 531.84±132 µm to 300.69±89 µm) at 1 month and 52.39% reduction (from 531.84±132 µm to 253.19±85 µm) at 3 months was observed ($p<0.01$, Tab. I). Of the 29 eyes that completed a 6-month follow-up (mean central macular thickness 286.8.8±92.9 µm), 12 (41.3%) eyes showed a recurrence of macular edema (mean central macular thickness of 12 eyes was 340.30±78 µm) on OCT (between 18 and -24 weeks) and corresponding diminution in visual acuity. Six of these eyes received a repeat intravitreal injection 5 months (1 eye), 6 months (3 eyes), and 7 months (2 eyes) following first intravitreal injection. Following repeat injection all six eyes experienced a decrease in mean central macular thickness on OCT and improvement in visual acuity (0.2±0.12 logMAR units). Of the remaining six eyes that had recurrent macular edema four patients did not

TABLE II - CENTRAL MACULAR THICKNESS ON OPTICAL COHERENCE TOMOGRAPHY AND VISUAL ACUITY (VA) IN MACULAR EDEMA ASSOCIATED WITH BRANCH RETINAL VEIN OCCLUSION BEFORE AND AFTER INTRAVITREAL TRIAMCINOLONE INJECTION

Visit	Mean CMT* (µm)	Minimum (µm)	Maximum (µm)	% Reduction†	VA‡	Difference in VA§
Baseline	458.40±149	301	667	–	1.24±0.5	–
Day 1¶	349.30±119.2	162	525	23	0.80±0.4	0.38±0.4
Week 1¶	288.00±122.1	127	484	37.17	0.70±0.3	0.54±0.4
Month 1¶	218.22± 99.2	121	430	52.39	0.67±0.3	0.57±0.4
Month 3¶	187.00± 47.3	140	250	59.09	0.59±0.3	0.59±0.6

*Central macular thickness (CMT) ± standard deviation
†% Reduction from the baseline CMT
‡ Visual acuity in logMAR units ± standard deviation
§ Paired difference in visual acuity from baseline in logMAR units ± standard deviation
¶Postinjection follow-up visit

consent for repeat injection and the remaining two eyes had central macular thickness of < 300 µm, thus not fulfilling the inclusion criteria. Fifteen eyes completed 9 months follow-up (mean central macular thickness 270.73±186.1 µm); 8 of these eyes (53.3%) developed recurrence of macular edema with a mean central macular thickness of 449.6±244 µm (for 8 eyes). Three of these eyes received a repeat intravitreal injection 10 months (2 eyes) and 11 months (1 eye) after first injection and showed a reduction in central macular thickness and improvement in visual acuity.

Baseline OCT showed macular edema with cystoid spaces in 37 eyes, diffuse spongy edema in 20 eyes, serous fluid collection in 14 eyes, and taut posterior hyaloid in 2 eyes. A reduction of variable degree in cystoid edema, spongy edema, and resolution of serous fluid collection was observed in all eyes following the intravitreal injection.

Mean visual acuity improved from 1.2±0.4 logMAR units at baseline to 0.87±0.3 logMAR units and 0.84±0.4 logMAR units at 1 month and 3 months, respectively ($p<0.01$, Tab. I). Improvement of 0.3 logMAR units or more was seen in 53% (30/57) of eyes at 1 month and 46% (26/57) of eyes at 3 months after injection. Maximum improvement in visual acuity from baseline as seen with paired difference values (0.31±0.3 logMAR units) was observed at 1 month following injection. Two eyes had decrease in vision on the first postoperative day. These two eyes showed diffuse dispersion of the drug suspension into the vitreous cavity obscuring the fundus view. At 1 week the visual acuity improved in these two eyes with head end elevation. Four (7%) eyes failed to show any improvement in visual acuity; two of these eyes had reduction in the macular thickness on OCT, but fundus examination showed collection of hard exudates forming a plaque in the macular area. The remaining two eyes had thickened posterior hyaloid with diffuse macular edema at baseline on OCT; one eye showed reduction in macular thickness after injection while the other eye had no obvious reduction in the macular thickness. Twelve eyes (at 6 months follow-up) and 5 eyes (at 9 months follow-up) had recurrence of macular edema following the injection and showed a decrease in the visual acuity from 3-month logMAR value. The visual acuity in eight of these eyes that received a repeat intravitreal injection showed an improvement (0.23±0.3 logMAR units).

In Group II mean preinjection visual acuity was 1.24±0.5 logMAR units (range 0.5–2.2). Mean duration of the visual loss was 65±12 days (36–210 days), and two eyes had one session of macular grid and sectoral laser photocoagulation before injection. Baseline central macular thickness on OCT was 458.40±149 µm (range 301–667 µm). A significant reduction in mean central macular thickness was observed at all the follow-up visits ($p<0.05$, Tab. II). Baseline OCT showed macular edema with cystoid spaces in 13 eyes, with serous fluid collection in 3 eyes. A variable reduction in cystoid spaces and complete resolution of serous fluid collection was observed in all eyes following the intravitreal injection. Improvement in mean visual acuity was noted (1.24±0.5 logMAR units at baseline to 0.67±0.3 logMAR units at 1 month and 0.59±0.3 logMAR units at 3 months, $p<0.05$) following injection. Improvement of 0.3 logMAR units was seen in 60% (6/10) of eyes at 1 month and 70% (7/10) of eyes at 3 months after

TABLE III - CENTRAL MACULAR THICKNESS ON OPTICAL COHERENCE TOMOGRAPHY AND VISUAL ACUITY (VA) IN MACULAR EDEMA ASSOCIATED WITH CENTRAL RETINAL VEIN OCCLUSION BEFORE AND AFTER INTRAVITREAL TRIAMCINOLONE INJECTION

Visit	Mean CMT* (µm)	Minimum (µm)	Maximum (µm)	% Reduction†	VA‡	Difference in VA§
Baseline	750.81±148.24	533	990	-	1.10±0.4	-
Day 1¶	485.54±186.80	282	956	35.33	1.00±0.4	0.05±0.2
Week 1¶	372.14±212	200	845	50.43	0.88±0.4	0.25±0.2
Month 1¶	210.55± 56.5	177	263	71.95	0.86±0.4	0.24±0.3
Month 3¶	182.20± 50.12	152	204	75.73	0.82±0.5	0.32±0.2

*Central macular thickness (CMT) ± standard deviation
†% Reduction from the baseline CMT
‡ Visual acuity in logMAR units ± standard deviation
§Paired difference in visual acuity from baseline in logMAR units ± standard deviation
¶Postinjection follow-up visit

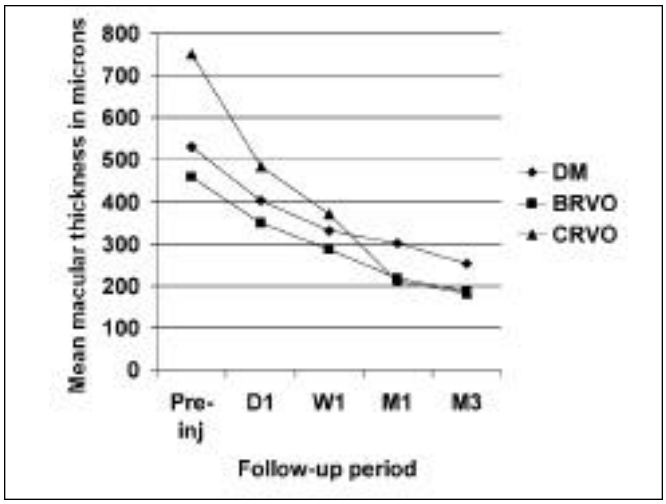

Fig. 1 - Central macular thickness changes following intravitreal triamcinolone injection. DM = diabetes mellitus; BRVO = branch retinal vein occlusion; CRVO = central retinal vein occlusion; pre-inj = preinjection; D1 = postinjection day 1; W1 = postinjection week 1; M1 = postinjection 1 month; M3 = postinjection 3 months.

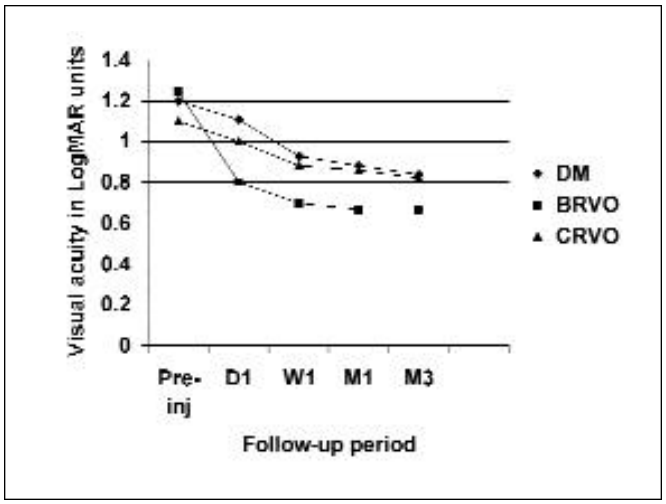

Fig. 2 - Visual acuity (logMAR units) changes following intravitreal triamcinolone injection. DM = diabetes mellitus; BRVO = branch retinal vein occlusion; CRVO = central retinal vein occlusion; pre-inj = preinjection; D1 = postinjection day 1; W1 = postinjection week 1; M1 = postinjection 1 month; M3 = postinjection 3 months.

injection. Six eyes completed 6 months follow-up. Two (2/6 eyes, 33.3%) of these eyes developed recurrence of cystoid macular edema on OCT and deterioration of visual acuity at 15 weeks and 18 weeks after injection. One of these eyes received a repeat intravitreal injection 7 months after the first injection and showed an improvement in visual acuity by 0.24 logMAR units and simultaneous decrease in central macular thickness on OCT. Three eyes completed 9 months follow-up and one of these eyes developed recurrence of macular edema on OCT with decrease in visual acuity.

In Group III, mean preinjection visual acuity was 1.10±0.4 logMAR units (range 0.6–1.7). Mean duration of the visual loss was 89±15 days (45–240 days), and 1 eye has had one session of macular grid and scatter laser photocoagulation before the injection. Baseline central macular thickness on OCT was 750.81±148 µm (range 533–990 µm). All eyes completed 3 months follow-up. A significant reduction in mean central macular thickness was observed at all follow-up visits ($p<0.01$, Tab. III). Baseline OCT showed macular edema with cystoid spaces in all eyes, with serous fluid collection in two eyes. Both cystoid spaces and serous fluid collection showed a resolution of variable extent in all the eyes following the intravitreal injection. Visual acuity improvement to 0.86±0.4 logMAR units and 0.82±0.5 logMAR units was noted at 1 month and 3 months, respectively ($p<0.05$). Improvement of 0.3 logMAR units was seen in 43% (6/13) of eyes at 1 month and at 3 months after injection. One eye developed infective endophthalmitis with severe visual loss (1 logMAR unit at baseline to light perception with inaccurate projection of light rays) 2 weeks following the injection. Six eyes completed 6 months follow-up. Three (3/6 eyes, 50%) of these eyes showed a recurrence of cystoid macular edema (14–19 weeks) on OCT and deterioration of visual acuity. One eye received repeat intravitreal injection (6 months following first injection) and experienced improvement in visual acuity (0.16 units) with reduction in macular edema. At 9 months follow-up (2 eyes) two eyes showed recurrence of macular edema and decrease in visual acuity.

Intraocular pressure at baseline was 15.20±2.4 mmHg. At least one record of high IOP (>24 mmHg) was seen in 33 eyes (40.7%) during the follow-up. These 33 eyes included 19 (37.2%) eyes in Group I, 6 eyes (60%) in Group II, and 8 eyes (61.5%) in Group III. In all these eyes the IOP settled down to the baseline level with one or two topical antiglaucoma medications. By the end of 3 months the IOP was comparable to baseline without any medication. Two eyes (Group I) developed uncontrolled IOP elevation; one of them developed an inferior arcuate visual field defect on perimetry and trabeculectomy was advised. The other patient was prescribed maximum tolerable medication and the IOP returned to baseline at 3 months postinjection, following which the treatment was withdrawn. One eye in Group I developed a posterior sub-

capsular cataract 14 weeks postinjection. One eye in Group III developed infective endophthalmitis. This patient had received an anterior chamber paracentesis during intravitreal injection. He experienced severe pain and redness 18 days after the injection and presented to us 3 weeks following injection. The visual acuity was reduced to light perception with inaccurate projection of light rays. Vitreous tap followed by an intravitreal injection of vancomycin 1 mg/0.1 mL and ceftazidime 2.25 mg/0.1 mL was performed under topical anesthesia. The microbiologic culture revealed coagulase negative Staphylococcus albus. The patient underwent pars plana vitrectomy. The final visual acuity achieved was light perception.

DISCUSSION

Use of intravitreal triamcinolone has been increasingly reported in the literature. It has been used in a variety of retinal disorders such as subretinal neovascular membrane (23) and macular edema associated with diabetes, vascular blocks (11-19), cataract surgery (24), uveitis (25), and retinitis pigmentosa (26). There are only a few prospective studies in this regard (12, 27). We prospectively evaluated the efficacy and safety of intravitreal triamcinolone in treatment of macular edema associated with retinal vascular disorder. All the three groups included in our study showed a reduction in macular edema and macular thickness on OCT following intravitreal triamcinolone. Reduction in macular edema was associated with increase in visual acuity.

In eyes with diabetic macular edema, Martidis et al (14) observed a 55% (1 month) and 58% (3 months) reduction in macular thickness following intravitreal triamcinolone injection; Massin et al (12) in their prospective controlled randomized trial showed an almost 60% decrease in macular thickness at 1 and 3 months postinjection. We observed a 44% and 52% decrease in the central macular thickness at 1 month and 3 months after injection. A slightly lower reduction in the macular thickness in our study could be owing to the higher baseline macular edema and higher baseline central macular thickness.

Martidis et al (14) reported an improvement of two or more lines in Snellen visual acuity in 64% of eyes at 1 month. Massin et al (12) reported a slightly lower visual gain. We have used the logMAR values for assessment in visual acuity, and noted an overall 0.31±0.3 units improvement in visual acuity at 1 month. However, due to different units used for assessment, the results are difficult to compare with the previous studies.

We observed a marked reduction in macular thickness and macular edema along with corresponding improvement in visual acuity in eyes with CRVO. In a study on effect of intravitreal triamcinolone in macular edema associated with CRVO, Park et al (16) found a much higher improvement in visual acuity; this could be related to a better preinjection visual acuity than our patients. The authors of this study used volumetric OCT to measure the quantitative effect of injection on macular edema; thus comparison with our observation was not possible.

Eyes with macular edema associated with BRVO showed a decrease in macular edema and improvement in visual acuity in all eyes. Jonas et al (27) studied the effect of intravitreal triamcinolone in patients with BRVO; they observed a significant improvement in the visual acuity postoperatively compared to the baseline acuity. The control group showed no significant improvement in visual acuity and ischemic subgroup in the treated group also failed to show any significant improvement in visual acuity.

Reduction in macular edema at 1 month was 43% in Group I, 52% in Group II, and 71% in Group III. We observed that the decrease in macular thickness on OCT was associated with improvement in visual acuity after intravitreal triamcinolone injection. Corresponding visual gain in logMAR units was 0.31 in Group I, 0.57 in Group II, and 0.24 in Group III (Figs. 1 and 2). Group II showed maximum improvement in visual acuity. Reduction in macular thickness was least in diabetic macular edema. Group III showed a maximum reduction in macular thickness as compared to baseline on OCT; however, the improvement in visual acuity was least. This suggests that the nature of the underlying disease may also have an influence on the visual outcome. Additionally, with the presence of macular plaque or hard exudates, as was seen in few of our patients with diabetic macular edema, the visual acuity may not improve despite decrease in macular thickness on OCT.

None of the eyes showed recurrence of macular edema within 3 months of the injection, suggesting that the effect of drug remains until this time. This is in agreement with the findings of Beer et al (28). Overall, 41 eyes completed 6 months follow-up and 20 eyes completed 9 months follow-up; 12/29 (41%) eyes in Group I, 2/6 (33%) eyes in Group II, 3/6 (50%) eyes in Group III, and 8/15 (53%) eyes in Group I, 1/3 (33%) eyes in Group II, and 2/2 (100%)

eyes in Group III developed recurrence of macular edema with worsening of visual acuity at 6 and 9 months respectively. Lowest recurrence rate was observed in Group II. Eleven eyes received repeat intravitreal injection and showed improvement in visual acuity and decrease in macular edema following the second injection. Our results show that intravitreal triamcinolone has transient effect in a significant percentage of patients and repeat injections are required.

Previous studies on animals and human trials have shown that intravitreal triamcinolone acetonide injection is a safe procedure (13-20). Complications encountered can be either related to the drug itself or to the procedure of injection (12, 14, 24). Drug-related complications include elevation of IOP and progression of cataract. Incidence of IOP elevation has been reported to vary from 25 to 70% (12, 29, 30). Almost 41% of patients in our study developed elevation of IOP. We observed that a relatively higher percentage (60–61%) of patients with vascular block (both BRVO and CRVO) developed IOP elevation compared to patients with diabetic macular edema (37%). An explanation for this finding is difficult to pinpoint. In most of the cases it could be controlled well with topical antiglaucoma medication. One patient, however, developed glaucomatous visual field defect and filtering surgery was advised. We excluded patients with history of glaucoma and ocular hypertension, and 41% of our patients still developed IOP elevation, suggesting that intravitreal triamcinolone should be cautiously used in patients with history of glaucoma or ocular hypertension. In our study one patient developed posterior subcapsular cataract. The rest of the patients did not show any progression of cataract.

Other injection-related posterior segment complications include retinal detachment, choroidal detachment, and vitreous hemorrhage. No acute complications were experienced in the current study.

None of our cases developed pseudoendophthalmitis (31). We encountered one case of infective endophthalmitis in our series. Incidence of endophthalmitis has been reported to be 0.87% or lower (12-15, 32). Two reports have suggested that vitreous wick syndrome could be a possible route for transmission of the infection via pars plana into the eye (33, 34). Exact time of entry of the pathogen into the eye in our single case is difficult to pinpoint as this patient also required an anterior chamber paracentesis during the injection procedure. A cautious and closer follow-up is advised in all cases.

Our study has certain limitations as it has no control group, and not all patients completed 6-month follow-up. Thus identification of exact time and incidence of recurrence of macular edema was not possible. During the short period of 3 months the study suggests that intravitreal triamcinolone may be considered as an effective option for reducing the diabetic macular edema and macular edema associated with retinal vein occlusion and it may result in improvement of the visual acuity. The main complication is transient IOP elevation. The infrequent occurrence of a serious complication such as infective endophthalmitis warrants a close and careful follow-up. Further studies are required to assess the long-term efficacy and safety and the need for repeated injection in these eyes.

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