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Subtenon Triamcinolone Acetonide versus Intravitreal Triamcinolone Acetonide for the Treatment of Diabetic Cystoid Macular Edema

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Abstract

Purpose: To investigate the efficacy of the posterior subtenon (SBT) capsule injection of TA as compared to intravitreal (IVT) injection of Triamcinolone Acetonide (TA) for the management of cystoid diabetic macular edema in pseudophakic patients.

Methods: This prospective randomized comparative study included 100 pseudophakic eyes with cystoid macular edema. They were divided into two equal groups; IVT group, treated with 2 mg IVT injection of TA and SBT group, treated with 40 mg SBT injection of TA. Central Subfield thickness SFT, best corrected visual acuity BCVA and intraocular pressure IOP were measured before and after one and three months of treatment

Results: There was statistically significant improvement in visual acuity in IVT and SBT groups. The SFT was significantly reduced both after one month and after three months when compared to the baseline values in both IVT and SBT groups. The SFT was comparable between the two groups especially after three months of treatment. The IOP of the eyes treated with IVT and SBT injection was significantly increased when compared to baseline value, but well controlled with glaucoma medication. There was insignificant difference between the IVT and SBT groups as regard to the mean IOP.

Conclusion: The subtenon approach of triamcinolone injection can be considered a valid safe and effective alternative to the intravitreal injection; however larger and longer multicenter studies are needed.

Keywords: Diabetes; Macular edema; Triamcinolone; Acetenoide; Intravitreal subtenone

Background

Macular edema is the commonest cause of visual loss in diabetic patients. Damaged tight junction in-between endothelial cells and pigmented epithelial cells lead to water and electrolytes leakage. According to the Early Treatment Diabetic Retinopathy Study (ETDRS), macular laser blocked further visual loss in half of patients. However, it was unable to restore the vision and not effective in the treatment of cystoid macular edema. Complications of intravitreal triamcinolone injections include hemorrhage, endophthalmitis and retinal detachment. Subtenon triamcinolone injection might offer a better choice, less invasive and deliver same therapeutic dose for the management of intermediate uveitis and macular edema [1-3]. The aim of this work was evaluation of the efficacy of posterior subtenon (SBT) triamcinolone injection for the management of diabetic cystoid macular edema in pseudophakic patients.

Methods

This comparative prospective controlled study treated 100 eyes. Fifty two patients were males and forty eight were females, aged between 41 and 74 years (mean 67.3). Inclusion criteria included pseudophakic diabetic patients complaining from cystoid diabetic macular edema without vitreomacular traction. Patients were informed about the procedures and the study aim. They signed informed consent form to participate according to the declaration of Helsinki in 1983. In all the patients; the best corrected visual acuity in logarithm of the minimum angle of resolution (log MAR) was reported using Snellen chart, as well as intraocular pressure (IOP) using applanation tonometry, anterior segment biomicroscopy. Central subfield thickness (SFT) was evaluated by optical coherence tomography (OCT 2000, Topcon, Japan). Exclusion criteria included previous ocular surgery other than cataract, glaucoma, ocular hypertension and uveitis. The patients were divided equally and randomly using computer software into two groups; IVT group and SBT group.

Procedures for the IVT injection, the surface anesthesia with topical 0.4% benoxinate hydrochloride was performed, followed by skin sterilization with 5% povidone iodine. A paracentesis was done. A volume of 2 mg of triamcinolone in 0.05 ml (Kenacort, Bristol-Myers Squibb, Sermoneta, Italy) was injected 3mm behind the limbus in the inferotemporal pars-plana using a 27-gauge needle. For the posterior SBT injection, the patients' eyes were directed superonasally. The conjunctiva and the Tenon's capsule were incised and 1 ml of a 40 mg/ml of triamcinolone acetonide (Kenacort, Bristol-Myers Squibb, Sermoneta, Italy) was given in the inferotemporal quadrant using 23G cannula. A paracentesis was done. Topical gatefloxacin and dexamethasone eye drops were used postoperatively for one week. The BCVA log MAR, IOP and SFT were reported one week, one month and three months postoperatively.

Statistical analysis

The data were statistically evaluated using SPSS 16.0 software. The ANOVA test and paired t test were used for comparison between the two groups. A "p<0.05" was considered significant.

Results

The intravitreal triamcinolone injection treated eyes showed statically significant improvement in best corrected visual acuity, one month postoperative (0.35 ± 0.1) (Log MAR 0.45 ± 0.05; p<0.001) and three months postoperative (0.3 ± 0.1) (Log MAR 0.5 ± 0.08; p<0.001) of treatment when compared to the preoperative values (0.14 ± 0.1) (Log MAR 0.85 ± 0.1). Significant improvement was displayed also in eyes treated with an SBT injection, again one month postoperative (0.35 ± 0.09) (Log MAR 0.45 ± 0.07; p<0.001) and three months postoperative (0.3 ± 0.09) (Log MAR 0.49 ± 0.06; p<0.001) when compared to the preoperative values (0.13 ± 0.09) (Log MAR 0.86 ± 0.1). No statistically significant difference in best corrected visual acuity was found between both groups during follow-up visits (table 1).The SFT of IVT injection treated eyes were significantly reduced both one month postoperative (225 ± 14 µm; p<0.001) and after three months (230 ± 10 µm; p<0.001) when compared to the preoperative values 385 ± 12 µm. The eyes treated with SBT injections showed significant improvement one month postoperative (220 ± 15 µm; p<0.001) and three months postoperative (235 ± 12 µm; p < 0.001) of treatment when compared to the baseline values of 383 ± 18 µm. The improvement in SFT was statistically insignificant between the two groups (table2). There was significant increase in the IOP of the IVT treated eyes one month postoperative (18.8 ± 1.8 mmHg; p=0.03), three months (17.2 ± 1.2 mmHg; p=0.02) when compared to baseline value (16.6 ± 1.6 mmHg). Glaucoma reduction eye drops were used to control the IOP. The eyes treated with SBT injection showed significant elevation in the IOP only after one month (17.4 ± 1.4 mmHg; p=0.01). IOP after three ms was (16.6 ± 1.6 mmHg) comparable to baseline value (16.4 ± 1.4 mmHg) (p=0.1). The mean IOP was significantly higher in IVT group than in SBT group after one month. However, it was statistically insignificant after three months of treatment (Table 3).

	Pretreatment visual acuity	First month after injection		three month after injection	
		visual acuity	p value*	visual acuity	p value*
Group I † (n=50)	0.85 ± 0.1	0.45 ± 0.05	<0.001	0.5 ± 0.05	<0.001
Group II ‡ (n=50)	0.86 ± 0.1	0.45 ± 0.06	<0.001	0.49 ± 0.06	<0.001
p value**	0.2	0.3	--	0.3	--

* Student t test against preoperative values
** Student t test between the two groups
† Intravitreal Triamcinolone Acetonide treated eyes
‡ Sub-Tenon Triamcinolone Acetonide treated eyes

Table 1: Visual acuity (log MAR) (mean ± standard deviation) of studied groups.

	Pretreatment SFT	First month after injection		three month after injection	
		SFT	p value*	SFT	p value*
Group I † (n=50)	385 ± 12	225 ± 14	<0.001	230 ± 10	<0.001
Group II ‡ (n=50)	383 ± 18	230 ± 15	<0.001	235 ± 12	<0.001
p value**	0.493	0.364	--	0.134	--

* Student t test against preoperative values
** Student t test between the two groups
† Intravitreal Triamcinolone Acetonide treated eyes
‡ Sub-Tenon Triamcinolone Acetonide treated eyes

Table 2: Central subfield thickness (SFT) (mean ± standard deviation) (µm) of studied groups.

	Pretreatment IOP	First month after injection		three month after injection	
		IOP	p value*	IOP	p value*
Group I † (n=50)	16.6 ± 1.6	18.8 ± 1.8	0.03	17.2 ± 1.2	0.02
Group II ‡ (n=50)	16.4 ± 1.4	17.4 ± 1.4	0.01	16.6 ± 1.6	0.1
p value**	o.712	<0.001	--	0.056	--

* Student t test against preoperative values
** Student t test between the two groups
† Intravitreal Triamcinolone Acetonide treated eyes
‡ Sub-Tenon Triamcinolone Acetonide treated eyes

Table 3: Intraocular pressure (IOP) (mean ± standard deviation) (mmHg) of studied groups.

Discussion

Macular edema is the main cause of loss of visual acuity in diabetic patients. Damaged tight junction in-between endothelial cells and pigmented epithelial cells, lead to water and electrolytes leakage. According to the Early Treatment Diabetic Retinopathy Study (ETDRS), macular laser blocked further visual loss in half of patients. However, it was unable to restore the vision and not effective in the treatment of cystoid macular edema. The diabetic retinopathy presents with features of chronic inflammation such as; vasodilatation, blood flow increase, tissue edema and vascular permeability. All experimental data such as; leukostasis in diabetes with adhesion of activated molecules to the endothelium, increased production of prostacyclin, vascular endothelial growth factor (VEGF) and macrophage cellular component confirm the involvement of pro-inflammatory molecules in the early stages of diabetic retinopathy. Corticosteroids inhibit the initial arachidonic acid cascade, down-regulate the cytokines and support the blood-retinal barrier [1,2]. The complications of intravitreal TA were endophthalmitis, intraocular hemorrhages, retinal detachment and IOP elevation in 20% to 80% of patients [1].

The subtenon TA was used in the management of intermediate uveitis and cystoid macular edema. A Correct injection makes delivery of the drug in the macular area is possible [1]. This work proved that intravitreal injection of TA and the subtenon injection of TA improved the visual acuity and an equally reduced the retinal thickness. A significant elevation of the IOP in the IVTinjection treated eyes was proved after one and three months. In a pilot study performed by Chew et al, they proved less central subfield thickness after SBT but after longer follow up [2]. Song et al. found a better improvement in visual acuity 8 weeks after IVT with less macular thickness which was superior to intravitreal bevacizumab injection [3]. On the other hand Marey et al. stated that intravitreal bevacizumab alone was better and safer than both intravitreal TA and combined intravitreal bevacizumab-TA because of higher IOP [4]. Also Chung et al proved the visual and foveal thickness improvement after SBT combined with laser macular therapy. It was comparable to IVT with lower IOP elevation [5]. Wang et al proved that, intravitreal injection of bevacizumab combined with or without triamcinolone acetonide was effective in treatment of DME [6]. Choi et al., Cellini et al. and Qi et al. reported that IVTA and SBT had same effects on DME, but that IVTA elevated IOP. Ozdek et al. proved that 8.2% of the SBT cases showed a significant elevation in IOP (>21 mmHg), and 24.3% of cases in the IVT group had a significant elevation in IOP. Bakri and Kaiser reported minimal elevation in IOP at 3 months that was normalized at 6 months [7-9]. Ozdek et al. compared the IVT and SBT effects. They stated that both SBT and IVT significantly reduced the retinal edema, although the effects were more pronounced in the IVT group, SBT also seemed to be a safe and effective technique for treating DME. Bakri and Kaiser reported that SBT was safe and effective on DME are refractory to laser photocoagulation [7]. Jonas et al. found that 50% of IVT patients had increased IOP. The SBT is considered to be less invasive than the intravitreal one. IOP is not elevated by the use of this approach except the steroid responder patients. Cataract progression, central retinal vein occlusion, globe perforation and central retinal artery occlusion were found to be complication of SBT. Other complications reported for this approach are conjunctiva necrosis, ptosis, orbital fat atrophy and squint and [9,10].

Conclusion

The subtenon route of triamcinolone injection might have the same safety and efficacy as the intravitreal triamcinolone injection route in the treatment of diabetic cystoid macular edema. Larger studies and longer follow up are needed.

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