Intravitreal triamcinolone versus posterior sub-Tenon triamcinolone with modified grid laser photocoagulation for diabetic macular edema

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Intravitreal triamcinolone versus posterior sub-Tenon triamcinolone with modified grid laser photocoagulation for diabetic macular edema

Directed by Professor Hyoung Jun Koh

The Master's Thesis submitted to the Department of Medicine, the Graduate School of Yonsei University in partial fulfillment of the requirements for the degree of Master of Medical Science

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This certifies that the Master's Thesis of Eun Jee Chung is approved.

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I dedicate the fruits of this research to my beloved family to whom without none could have been accomplished.

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Diabetic macular edema(DME) is the major cause of visual impairment in diabetic patients.[1] Focal/grid laser photocoagulation has been a standard of care for DME but only 17% of eyes had any improvement in visual acuity, and less than 3% had a visual improvement of 3 or more ETDRS lines after laser treatments.[2-4] Moreover, a significant number of patients with diabetic macular edema, especially diffuse types, remains refractory to focal or grid laser treatments, which has driven many investigators to seek for alternative treatments for the management of

DME.

This study is to prospectively compare the efficacy of posterior sub-Tenon's capsule triamcinolone injection combined with modified grid macular photocoagulation and intravitreal triamcinolone injection (IVTA) in the treatment of diffuse diabetic macular edema (DME).

This sigle-center, prospective, randomized clinical trial included thirty-three patients (40 eyes) with diffuse DME. A total of 20 eyes received posterior sub-Tenon injection of triamcinolone combined with modified grid macular photocoagulation and the second group of 20 eyes, IVTA. The main outcome measures were Early Treatment Diabetic Retinopathy Study (ETDRS) visual acuity (VA) scores, changes in central macular thickness and total macular volume measured by optical coherence tomography 3 (OCT3).

The ETDRS scores at baseline were 25.15 ± 13.56 (mean ± SD) letters in the Posterior Subtenon Injection group and 21.70 ± 16.28 letters in the IVTA group. The ETDRS scores significantly improved at 1,3 and 6 months after the treatments by 33.20 ±15.91, 34.65 ± 16.59 and 30.90 ± 19.07 letters in the Posterior Subtenon Injection group vs 30.95 ± 15.36, 30.05 ± 17.91 and 31.50 ± 14.98 letters in the IVTA group, respectively (no statistically significant difference between two groups). The central

macular thickness at baseline and 1,3,6 after the treatments were 382.80 ± 148.26, 309.14 ± 131.32, 319.25 ± 93.31, 340.40 ± 123.50 μm (mean ± SD) in the Posterior Subtenon Injection group vs 369.05 ± 123.09, 241.42 ± 52.34, 277.47 ± 137.36, 290.21 ± 127.93 μm in the IVTA group, respectively. The difference between the two groups was significant at 1 month (more decrease in the IVTA group) but no longer significant after 3 months. The IVTA group was associated with significant elevation of IOP at 1month with 3 of 20 eyes (15%) having elevated IOP comparing with baseline values and showed a significant increase in average cataract grading compared with the Posterior Subtenon Injection group.

In conclusion, posterior sub-Tenon's capsule triamcinolone acetonide injection combined with modified grid laser photocoagulation provides significant improvement in vision over 6 months and achieves comparable outcomes to IVTA with fewer complications in treatment of diffuse DME.

Key words: Diabetic macular edema, intravitreal triamcinolone acetonide injection, posterior subtenon triamcinolone injection

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I. Introduction

Diabetic macular edema(DME) is the major cause of visual impairment in diabetic patients.[1] Based on the observations of Early Treatment Diabetic Retinopathy Study (ETDRS) Group, focal/grid laser photocoagulation has been a standard of care for DME but only 17% of eyes had any improvement in visual acuity, and less than 3% had a visual improvement of 3 or more ETDRS lines after laser treatments.[2-4] Moreover, a significant number of patients with diabetic macular edema, especially diffuse types, remains refractory to focal or grid laser treatments, which has driven many investigators to seek for alternative

treatments for the management of DME.

Among alternative treatments currently under investigation, triamcinolone acetonide has been reported efficacious when administered either by intravitreal or posterior sub-Tenon's route for diffuse DME refractory to laser treatment.[5-13] A recent report has shown intravitreal injection of triamcinolone acetonide may be more effective than the sub-Tenon's infusion of the drug.[14] The intravitreal route probably results in higher levels of drug to macular area whereas the drug in posterior sub-Tenon injection has to cross the sclera and choroid, and lower levels may contribute to the lower effectiveness. However, intravitreal injections carry a higher risk of vision-threatening ocular complications such as acute infectious endophthalmitis, intraocular hemorrhage, retinal detachment and glaucoma.[5-7,15-17] Periocular administration of triamcinolone acetonide is relatively safe and less invasive compared to the intravitreal injections. Considering the frequent recurrence of DME that necessitate the repeated injections, posterior subtenon injection may still be a safe and efficacious alternative to the intravitreal injection for DME refractory to the laser treatment.

In the current study, we report the results of a randomized clinical trial contrasting efficacy and safety outcomes of intravitreal triamcinolone

acetonide injection (IVTA) and posterior sub-Tenon triamcinolone injection combined with modified grid laser photocoagulation in the management of diffuse clinically significant diabetic macular edema (CSME).Also, mechanisms of increased diffusion by the modulation of calcium channels,[12] and improvements in blood-retinal barrier function[13] [14] [15] may contribute to the healing effects of corticosteroids.

II. Materials and Methods

The study was a prospective, randomized clinical trial at Yonsei University Eye & ENT Hospital vitreoretinal service. The study followed the tenets of Declaration of Helsinki and was approved by the local institutional review board. Informed consent was obtained from every patient after explanation of the nature and possible consequences of the study. Forty eyes of 33 patients who visited our clinic from June 2005 to November 2005 with diabetic CSME were recruited.

The patients were included in the study if they had diffuse CSME due to diabetic retinopathy as defined clinically significant according to the ETDRS, and generalized breakdown of the inner blood-retina barrier, documented by diffuse fluorescein leakage on angiography and diffuse thickening of retina on OCT involving the foveal center and most of the macular area. The exclusion criteria were (1) intraocular surgery including cataract extraction within the last 6 months of enrollment; (2) laser treatments including panretinal photocoagulation, posterior capsulotomy, focal/grid macular photocoagulation within the last 6 months; (3) prior history of elevated intraocular pressure responsive to steroid treatment; (4) history of glaucoma or ocular hypertension; (5)

presence of comorbid ocular conditions that may affect visual acuity.

Ophthalmic examinations to evaluate the macular edema was performed using 90+ diopter noncontact lens slit lamp biomicroscopy. Fluorescein angiography, color fundus photography and 3rd generation Optical Coherence Tomography (OCT3; Stratus Zeiss Humphrey, San Leandro, Ca) were performed by the same experienced masked ophthalmic technician. The best corrected VA was determined with the ETDRS chart.[18] Central macular thickness and total macular volume were measured by OCT 3 by means of the Fast Macular Thickness scan. Intraocular pressure was measured by a Goldman applanation tonometer. Cataract progression was determined according to the Lens Opacities Classification System III grading system.[19] Patients were monitored for potential injection and laser-related complications.

Examinations were carried out at baseline, and 1 month, 3 months and 6 months after treatment and the results were evaluated by the same masked retinal specialist (HL). The patient's treatment groups were masked during the follow-up visits.

Forty eyes of 33 patients were randomized into 2 treatment groups. A total of 20 eyes received posterior subtenon triamcinolone injection with modified grid laser photocoagulation and the second group of 20 eyes,

IVTA. After the randomization, the treatment procedures were carried out by the same retinal specialist (HJK).

The IVTA group received intravitreal injection of 4 mg triamcinolone acetonide (0.1 cc). The injections were performed using 0.5% proparacaine drop for topical anesthesia under sterile conditions. The site of injection was localized 3.5 mm posterior to the limbus. Through the inferotemporal pars plana, 4 mg of TA (0.1 cc) was injected through a 30-gauge needle. The proper intravitreal localization of the suspension and the perfusion of the optic nerve head were then confirmed by indirect ophthalmoscopy.

The Posterior Subtenon Injection group received posterior subtenon triamcinolone injection after macular photocoagulation on the same day. We performed macular grid photocoagulation in spots of 100 µm diameter, with a 1-2 burn width spacing, with an exposure time of 0.1-0.2 seconds and laser power of 100-150 mW. Grid laser photocoagulation was performed by placing medium white laser burns over the area with thickness of ≥350 µm, documented on the OCT Fast Macular Thickness scan. The laser treatment over papillomacular bundle was avoided. After the modified grid laser treatment, the posterior subtenon triamcinolon injection was performed. Before injection, 0.5% proparacaine drop was

applied and 40 mg of TA (1 ml) was injected with a 25-gauge, 5/8-inch-long needle attached to the tuberculin syringe. The patient was instructed to look down and the upper lid was lifted. The superotemporal conjunctival fornix was penetrated with the needle at bevel down position.[20] The needle was advanced along the sclera posteriorly with a side-to-side weeping motion to avoid scleral penetration until the the hub of the needle was reached and 40 mg of TA (1 ml) was injected.

The main outcome measures included ETDRS VA scores, central macular thickness and total macular volume by OCT 3. The ETDRS VA scores were measured in a masked pattern by determining the number of letters patients were able to read from the ETDRS charts. The scores recorded equaled the number of letters read correctly and ranged from 0 to 70. A score of 55 was equivalent to 20/20 on Snellen chart. The main outcome measurements were performed in all cases at baseline and 1, 3 and 6 months after treatment. Secondary end points were the complication rates. Intraocular pressure was measured by a Goldman applanation tonometer and cataract progression was determined according to the Lens Opacities Classification System III grading. Marginal reflex distance 1 was measured before and after the treatment to document the injection-related ptosis.

Taking into account the results of previous studies and our preliminary data with intravitreal and posterior subtenon injections for diabetic macular edema, we determined the sample size (at least 18 eyes for each group) to detect, with an alpha of 0.05 and a 80% power, a 35% in reduction in macular thickness.[5,6] Adjusting for an estimated loss to follow-up of 10% during the study, we aimed to recruit 20 eyes for each group.

For statistical analysis, we used the SPSS® 12.0.1 (SPSS Inc., Chicago, IL) for Windows program. The numerical variables were subjected to an independent samples *t*-test, and the categorical variables were subjected to a chi-square test to ensure that they were comparable. The follow up parameters were analyzed using repeated measures ANOVA and repeated measures ANCOVA. The level of statistical significance was set at $P<0.05$.

III. Results

Forty eyes of 33 patients (15 men, 25 women), aged between 36 and 79 (mean 61.73± 8.69 years), were included in the study. A total of 20 eyes were treated with posterior sub-Tenon triamcinolon injection with modified grid and 20 eyes were treated with IVTA. All randomized eyes followed the assigned treatment by the end of the study. There was no statistically significant difference in baseline characteristics such as age, gender distribution, duration of diabetes, stage of retinopathy, lens status, the number of prior macular photocoagulation procedures, visual acuity, intraocular pressure and central macular thickness between the 2 groups.

Table 1. Baseline characteristics

Variable	PSTI+MP group (n=20)	IVTA group (n=20)	P value
Age, mean ± SD, y (range)	61.9 ± 8.3 (51-79)	61.6 ± 9.3 (36-76)	.90*
Gender No.			.74†
Male (%)	8 (40)	7 (35)	
Female (%)	12 (60)	13 (65)	
Duration of diabetes, mean ± SD, y	14.6 ± 4.3	15.4 ± 12.3	.79*
Lens, No.			.14†
Phakic (%)	17 (85)	13 (65)	
Pseudophakic (%)	3 (15)	7 (35)	
Status of DR			.19†
NPDR (%)	15 (75)	11 (55)	
PDR (%)	5 (25)	9 (45)	
Prior grid sessions, mean, No. (range)	0.2 (0-1)	0.3 (0-1)	.47†
ETDRS scores, mean ± SD	25.2 ± 13.6	21.7 ± 16.3	.47*
IOP, mean ± SD, mmHg	15.5 ± 3.9	14.4 ± 3.2	.32*
Central macular thickness, mean ± SD, um	382.8 ± 148.3	369.1 ± 123.1	.75*

PSTI+MP=posterior subtenon triamcinolone injection + grid laser macular photocoagulation; IVTA= intravitreal triamcinolone acetonide injection; DR=diabetic retinopathy; NPDR=nonproliferative diabetic retinopathy; PDR= proliferative diabetic retinopathy; ETDRS=Early Treatment of Diabetic Retinopathy Study; IOP=intraocular pressure.

* Independent samples t test. † Pearson χ^2 test.

Early Treatment Diabetic Retinopathy Study Scores

Before treatment, mean ± SD ETDRS scores at baseline and 1, 3, 6 months after the treatments were 25.15 ± 13.56, 33.20 ±15.91, 34.65 ± 16.59, 30.90 ± 19.07 in the Posterior Subtenon Injection group vs 21.70 ± 16.28, 30.95 ± 15.36, 30.05 ± 17.91, 31.50 ± 14.98 in the IVTA group, respectively. The differences between baseline ETDRS scores and values at all time points were statistically significant in both groups at 1 ($P < 0.001$ for both Posterior Subtenon Injection and IVTA, repeated measures ANOVA), 3 ($P < 0.001$ for Posterior Subtenon Injection, $P = 0.001$ for IVTA) and 6 months ($P = 0.036$ for Posterior Subteon Injection, $P < 0.001$ for IVTA) after the treatment.

The difference in baseline visual acuities between two groups were not statistically significant ($P = 0.47$, *t* test). The analysis to compare the follow up ETDRS scores between two groups was done using repeated measures ANCOVA to neutralize the effect of the baseline difference. The differences in ETDRS scores between two groups were not significant at any follow up examinations. ($P = 0.78$, 0.68, 0.277 at 1, 3, 6 months respectively.) (Figure 1, Table 2).

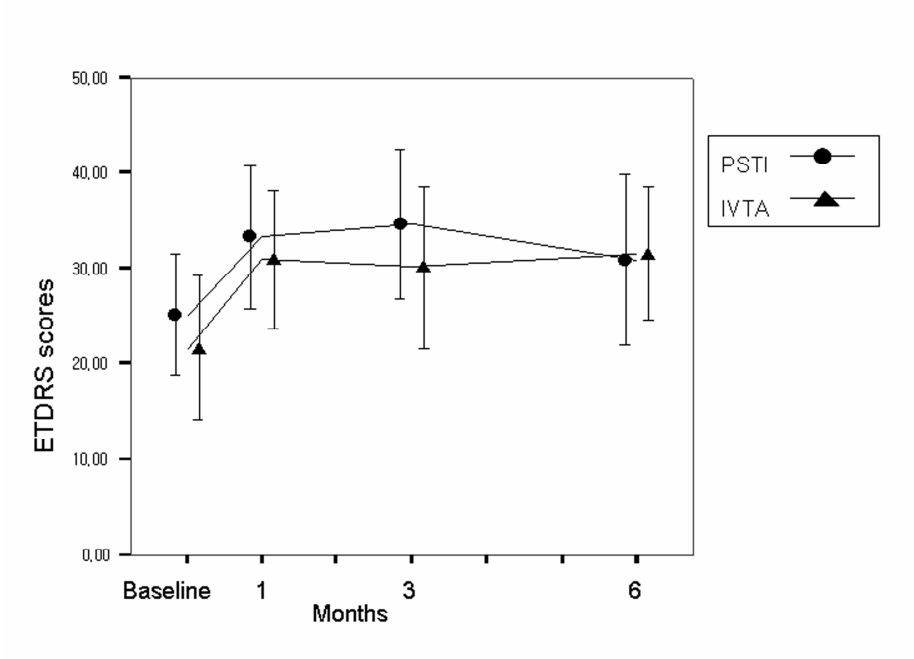

Figure 1. Changes in ETDRS scores after treatment

Table 2. Changes in ETDRS scores

Time points (months)	PSTI + MP (n=20)	P value*	IVTA (n=20)	P value*	P value†
0	25.2 ± 13.6		21.7 ± 16.3		.47
1	33.2 ± 15.9	<.001	31.0 ± 15.4	<.001	.78
3	34.7 ± 16.6	<.001	30.1 ± 17.9	.001	.68
6	30.9 ± 19.0	.036	31.5 ± 15.0	<.001	.277

PSTI+ MP= posterior subtenon triamcinolone injection + grid laser macular photocoagulation; IVTA= intravitreal triamcinolone acetonide injection

* baseline vs follow up measures within a group

† PSTI+ MP group vs IVTA group

In patients who had visual improvement, 10 of 20 eyes (50%) in the Posterior Subtenon Injection group and 11 of 20 eyes (55%) in the IVTA group showed an increase of more than one line in ETDRS scores at 6 months.

Central Macular Thickness

The mean ± SD central macular thickness at baseline and 1, 3, 6 months after the treatments were 382.80 ± 148.26, 309.14 ± 131.32, 319.25 ± 93.31, 340.40 ± 123.50 μm in the Posterior Subtenon Injection group vs 369.05 ± 123.09, 241.42 ± 52.34, 277.47 ± 137.36, 290.21 ± 127.93 μm in the IVTA group, respectively. The OCT was taken at all study eyes in the Posterior Subtenon Injection group at every time points but one in the IVTA group missed OCT measurement at 6 month follow up due to dense cataract development after the injection.

The differences between baseline and values obtained at follow-up examinations were statistically significant at 1 month (P = 0.01 for Posterior Subtenon Injection group, P = 0.000 for IVTA group, repeated measures ANOVA) and 3 months (P = 0.016 for Posterior Subtenon group, P = 0.018 for IVTA group) in both groups. The differences gradually decreased and were not significant at 6 months in both Posterior Subtenon Injection and IVTA groups (P = 0.11, P = 0.05

respectively).

The difference in baseline central macular thickness between two groups was not statistically significant (*P* = 0.75, *t* test). The difference in the central macular thickness between two groups was significant at 1 month (*P* = 0.007, repeated measures ANCOVA) but the differences were no longer significant at 3 and 6 months (*P* = 0.245, 0.211, respectively).

The mean central macular thickness at 1,3 and 6 months after treatment in the Posterior Subtenon Injection and IVTA groups were shown in Figure 2.

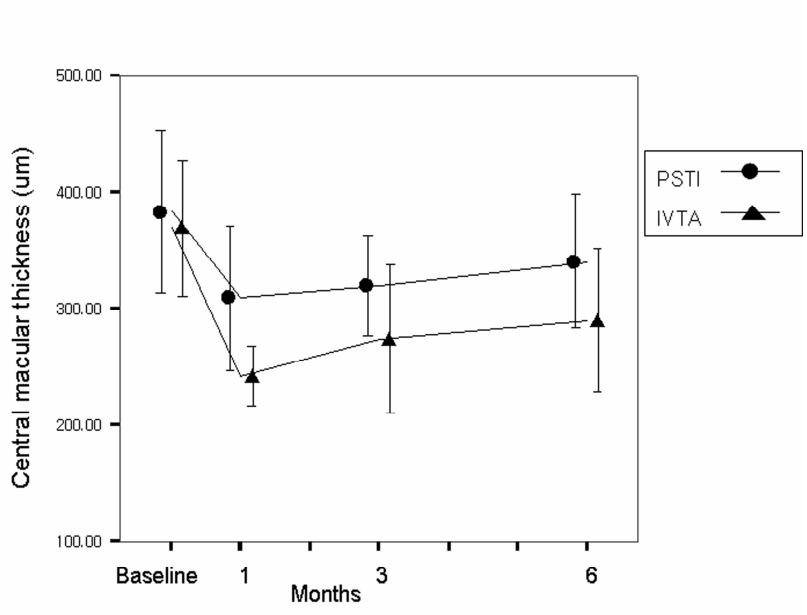

Figure 2. Changes in central macular thickness after treatment

Total macular volume

The mean ± SD total macular volume at baseline and 1, 3, 6 months after the treatments were 9.09 ± 1.63, 8.64 ± 1.40, 8.66 ± 1.74, 8.79 ± 1.66 mm^3 in the Posterior Subtenon Injection group vs 10.20 ± 2.78, 7.78 ± 0.98, 8.08 ± 1.05, 8.73 ± 1.73 mm^3 in the IVTA group, respectively (Figure 3).

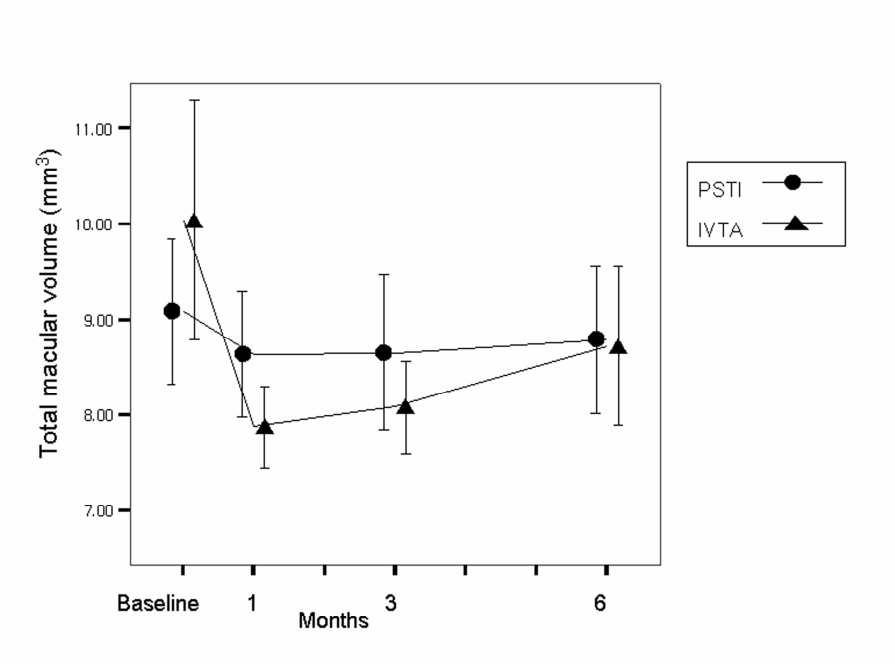

Figure 3. Changes in total macular volume

The differences between baseline and follow-up examinations were significant at 1 month (*P* = 0.01, repeated measures ANOVA) but were

no longer significant at 3 and 6 months (*P* = 0.187, 0.301 respectively) in the Posterior Subtenon Injection group. The corresponding values in the IVTA group were found to be significant at all time points (*P* = 0.001, 0.005, 0.02 at 1, 3 and 6 months respectively).

The difference in baseline total macular volume between the two groups was not statistically significant (*P* = 0.184, *t* test). The difference was significant at 1 month (*P* = 0.000, repeated measures ANCOVA) but it gradually decreased and were no longer significant at 3 and 6 months after the treatments (*P* = 0.051, 0.331, respectively).

Complications

The mean ± SD IOP before and at 1, 3 and 6 months after treatment were 15.50 ± 3.94, 14.50 ± 3.00, 14.25 ± 2.73 and 15.35 ± 3.62 mmHg in the Posterior Subtenon Injection group vs 14.35 ± 3.22, 16.30 ± 3.01, 16.50 ± 5.20 and 14.45 ± 2.76 mmHg in the IVTA group, respectively (Figure 4).

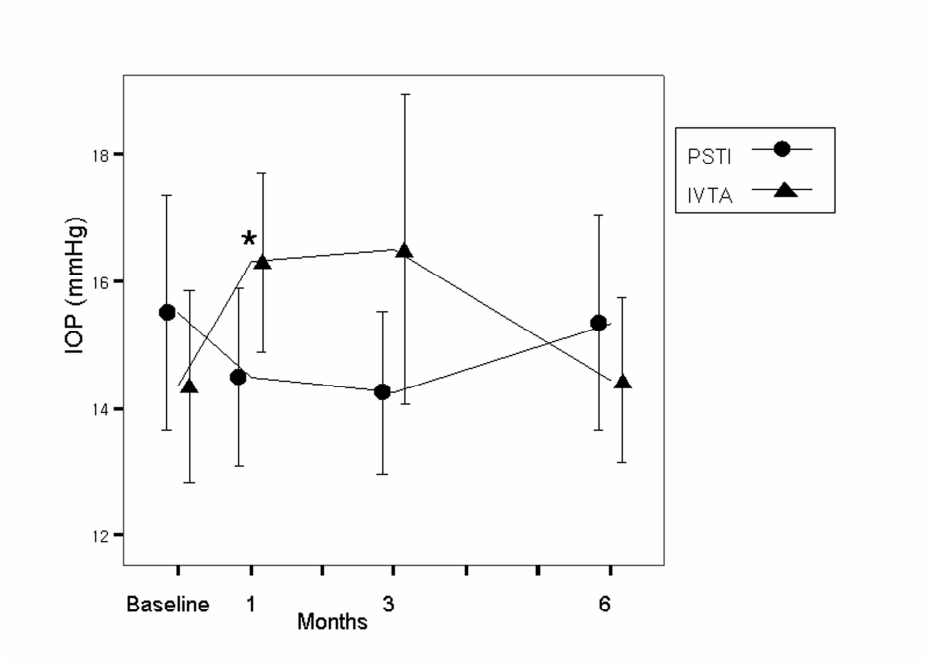

Figure 4 Changes in intraocular pressure

***** IOP elevation vs baseline at 1 month was significant in the IVTA group (repeated measures ANOVA, p=0.02).

The differences between baseline and values obtained at follow-up examinations were not significant at any time points in the Posterior Subtenon Injection group. However, IOP was elevated to the level of statistical significance at 1 month in the IVTA group (p=0.02) and gradually decreased at 3 and 6 months (p=0.11, 0.90 respectively).

Three of 20 (15%) in the IVTA group developed elevation of IOP

exceeding 21 mmHg which were controlled with topical anti-glaucomatous agents. None of the eyes that received posterior subtenon injection developed increased IOP exceeding 21 mmHg.

One of 20 (5%) in the Posterior Subtenon Injection group was complicated with mild ptosis that gradually improved at the end of the study.

The average increase in cataract grading compared to the baseline values according to LOCS III was 0.62 ± 0.81 (mean ± SD) in the Posterior Subtenon Injection group and 1.54 ± 1.33 in the IVTA, significantly higher in the latter (P = 0.043, t test). Significant cataract progression that necessitated cataract surgery was noted in 1 of 13 (7.7%) phakic eyes in the IVTA group and none of the eyes treated with posterior subteon injection. The cataract complicated after IVTA was treated with extracapsular cataract extraction with posterior chamber intraocular lens implantation after the end of the study.

Serious vision-threatening complications such as infectious endophthalmitis, vitreous hemorrhage, scleral perforation and retinal detachment were not encountered in any of the study eyes.

IV. Discussion

In recent years, application of triamcinolone acetonide either via intravitreal or posterior sub-Tenon's route has provided promising results for treatment of diffuse DME refractory to laser treatment.[5-13] The advantages of periocular administration of triamcinolone versus intravitreal injection include a lower risk of endophthalmitis and IOP elevation. However, Bonini-Filho et al compared the treatment results of intravitreal injection versus sub-Tenon's infusion of triamcinolone acetonide for diffuse DME and suggested that IVTA might be more effective than posterior sub-Tenon injection.[14] In their study, no significant changes in visual acuity were observed from baseline in patients subjected to posterior sub-Tenon triamcinolone injection.

IVTA has become increasingly popular for DME and in some cases may be used after an initial laser treatment failure or instead of laser treatment as a primary treatment.[21,22] However, the effect of the corticosteroid delivered by IVTA did not last longer than 6 months after the injection and recurrence of macular edema often require repeated IVTA.[5,6] The problem with repeated intraocular injection of triamcinolone acetonide is it may predispose the patients to the cumulative risk of

injection-related complications such as cataract progression, infectious endophthalmitis, intraocular hemorrhage, retinal detachment and glaucoma.[5-7,15-17]

Considering the advantages of periocular administration of triamcinolone versus intravitreal injection which include a lower risk of endophthalmitis, cataract progression and IOP elevation, delivery of triamcinolone via the sub-Tenon's route may offer a safer alternative to intravitreal injection. Thus, we performed modified grid laser macular photocoagulation on the same day of posterior sub-Tenon triamcinolone injection in order to gain an additive effect of the laser treatment as other authors have previously achieved favorable results.[10,13] The modified grid laser macular photocoagulation is not the same as used in the ETDRS treatment protocol but has been reported to be an effective modality in maintaining or improving visual acuity in eyes with diffuse DME in assessing long-term visual outcome.[23] We included the patients with diffuse DME in the study and performed modified grid laser for diffuse thickening of the retina, documented by the OCT 3 Fast Macular Thickness scan since several studies demonstrated the value of OCT for the detection of foveal thickening in DME with better sensitivity than clinical examinations.[24-28] It was beyond the scope of our study to

determine whether grid laser treatment according to the standard ETDRS protocol would result in even better results by using more laser treatment spots to a broader area of macular thickening. Further study regarding this issue appears to be warranted.

In our study, posterior sub-Tenon triamicinolone injection combined with modified grid macular photocoagulation was as effective as IVTA in treatment of diffuse DME in 6 month trial. Significant improvement in visual acuities was apparent from 1 month and maintained by 6 months in both groups after the treatment. The duration of the treatment effect seems to last longer in the IVTA group since the ETDRS scores started to decline after 3 months in the Posterior Subtenon group and remained stable in the IVTA group. The significant reduction in central macular thickness was observed at 1 and 3 months after treatment in both groups. The IVTA group showed faster resolution of macular edema and significantly better anatomic result at 1 month. However, the difference gradually decreased and was no longer significant afterwards.

Regarding the complications associated with injections, we observed statistically significant elevation of IOP at 1 month and 15% of IOP elevation which necessitated anti-glaucomatous treatment in the IVTA group whereas none of the eyes showed significant elevation of IOP in

the Posterior Subtenon Injection group. The IVTA group also showed significantly higher average increase in cataract grading compared to the Posterior Subtenon Injection group. The rate of significant cataract progression which necessitated surgery is within the range of previously reported incidence which has been variable from 0 to 23%.[5-8, 10,14,29-31] Considering relatively short term follow-up period in this study, higher rate of cataract progression may be observed in long-term follow-up in both treatment groups. Only one eye (5%) in the Posterior Subtenon Injection was complicated with mild ptosis that gradually improved by the end of the study.

Some limitations are inherent in our study because of the possible confounding influence of cataract on the visual acuity of the IVTA group, small sample size, and limited length of follow-up. Since we observed significant increase in average cataract grading in the IVTA group, the visual acuity effect in the IVTA group might be underestimated by some lens opacification that was not considered clinically significant as to treat with cataract surgery at the time of observation. However, the anatomic results obtained by OCT studies suggest that the effect of both treatments is similar after 3 months. Further studies in larger population group will be necessary to evaluate the long-term effects of posterior

sub-Tenon triamcinolone injection combined with modified grid laser macular photocoagulation in the treatment of DME.

In terms of statistical analysis, since there were 7 bilateral cases, 3 cases in the Posterior Subtenon Injection group and 4 in the IVTA group, we also carried out statistical analysis by patients including only right eye of the each patient to eliminate the influence of possible contralateral effects of the IVTA. The results were similar with the analysis by the eyes but are not shown here.

V. Conclusion

In summary, our results suggest that posterior sub-Tenon triamcinolone injection combined with modified grid macular laser photocoagulation provides improvement in vision over 6 months and achieves comparable outcomes to IVTA in treatment of diffuse DME with fewer complications in our pilot sample. Further studies using macular grid photocoagulation with repeated posterior sub-Tenon's capsule triamcinolone injection at intervals of every 3 to 6 months are indicated as our study suggests that this regimen would yield vision improvement rates similar to IVTA but with fewer complications and offer an safer alternative especially for the patients with relatively good visual acuity in whom the risks of intravitreal injection may not outweigh the treatment benefit.

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Abstract in Korean

당뇨 황반 부종에서 격자 레이저와 테논낭하 트리암시놀론 주입술 병합요법과 유리체강내 트리암시놀론 주입술의 효과

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정 은 지

황반 부종은 당뇨병 환자에서 가장 흔한 시력 저하의 원인이다.[1] 국소/격자 레이저 치료는 당뇨 황반 부종의 치료에 효과가 입증된 치료법이나 17%에서만이 시력의 호전이 있으며 3줄 이상의 시력 호전이 있었던 군은 3%에 불과한 것으로 보고된 바 있다.[2-4] 또한, 확산 부종을 가지는 황반 부종의 경우 기존의 레이저 치료에 반응하지 않는 환자가 많다. 따라서 많은 연구자들이 당뇨 황반 부종의 효과적인 치료법을 찾기 위해 연구하고 있다.

본 연구는 전향적 연구로서 40안 33명의 확산 부종을 가지는 당뇨 황반 부종 환자의 치료에서 격자 레이저와 후테논낭하 트리암시놀론 주사의 병합 요법 (Posterior Subtenon Injection 군)과 유리체강내

트리암시놀론 주입술 (IVTA 군)의 효과를 비교하고자 하였다. 총 20안에서 격자레이저와 후테논낭하 트리암시놀론 병합 요법을 시행하였으며 나머지 20안에서 유리체강내 트리암시놀론 주사를 시행하였다. 모든 환자에서 시술 전과 시술 후 1, 3, 6 개월에 Early Treatment Diabetic Retinopathy Study (ETDRS) 차트를 이용하여 최대 교정 시력과 Opticcal coherence tomography 3 (OCT3)를 이용하여 중심 황반부 두께 (central macular thickness)와 총 황반부피 (total macular volume)를 측정하였다.

시술 전 ETDRS 점수는 Posterior Subtenon Injection 군에서 25.15 ± 13.56 (mean ± SD) 개 였으며 IVTA 군에서는 21.70 ± 16.28 개였다. ETDRS 점수는 시술 후 Posterior Subtenon Injection 군에서 1, 3, 6 개월에 각각 33.20 ±15.91, 34.65 ± 16.59 and 30.90 ± 19.07 개였으며 IVTA 군에서 30.95 ± 15.36, 30.05 ± 17.91, 31.50 ± 14.98 개였다. 시술전과 비교하여 두 군에서 모두 의미있는 시력 상승이 관찰되었으며 각각의 경과 관찰 시점에서 두 군 간에 의미있는 차이는 없었다. 중심 황반 두께는 Posterior Subtenon Injection 군에서 시술전과 시술 후 1, 3, 6개월에 각각 382.80 ± 148.26, 309.14 ± 131.32, 319.25 ± 93.31, 340.40 ± 123.50 μm (mean ± SD) 였으며 IVTA 군에서는 369.05 ± 123.09, 241.42 ± 52.34, 277.47 ± 137.36, 290.21 ± 127.93 μm 였다. 두 군에서

모두 시술 전과 비교하여 시술 후 의미있는 중심 황반 두께의 감소 소견을 보였다. 두 군간의 차이는 시술 후 1개월에 IVTA 군에서 더 많은 감소를 보였으나 그 차이는 점차 줄어들어 3개월 이후에는 두 군간의 의미있는 차이는 없었다. 합병증과 관련하여서는 IVTA 군의 경우 시술 후 1개월에 의미있는 안압 상승을 보였으며 20안 중 3안(15%)에서 약물 치료가 필요한 안압 상승을 보였다. 또한 시술 후 6개월에 의미있는 평균 백내장 점수의 증가를 나타내었다.

결론적으로 격자 레이저와 후테논낭하 트리암시놀론 주사 병합요법은 확산 누출을 가지는 당뇨 황반 부종의 치료에서 시술 후 6개월까지 유리체강내 트리암시놀론 주사와 비슷한 치료 효과를 나타내었으며 합병증의 병발 빈도는 더 적었다.

핵심 되는 말: 당뇨 황반 부종, 유리체강내 트리암시놀론 주사, 후테논낭하 트리암시놀론 주사