



ORIGINAL ARTICLE

Role of Suprachoroidal versus Intravitreal injection of triamcinolone: In diabetic macular edema.

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ABSTRACT... Objective: To assess the efficacy of suprachoroidal versus intravitreal injection of triamcinolone in diabetic macular edema. **Study Design:** Randomized Controlled Trial. **Setting:** Department of Ophthalmology, Ziauddin Hospital Kemari, Karachi. **Period:** 1st November 2022 and 30th October 2023. **Methods:** The study observed 71 eyes of 59 patients diagnosed with Diabetic macular edema. All patients that met the inclusion criteria were divided into two groups, Group A Suprachoroidal Triamcinolone and Group B Intravitreal Triamcinolone. **Results:** This research encompasses 71 eyes from 59 patients diagnosed with diabetic macular edema, divided into two groups based on their chosen treatment. Group A consisted of 34 patients, whereas Group B comprised 37 patients. The average age of patients in both groups was 43.6 ± 6.2 . Baseline visual acuity and macular thickness were recorded in both groups and compared after treatment. Significant improvement was observed in both groups, particularly notable in the 3rd month. The suprachoroidal triamcinolone injection exhibited a more stable response, accompanied by lower complication rate. **Conclusion:** In conclusion, the comparative analysis of Suprachoroidal Triamcinolone acetate and Intravitreal Triamcinolone Acetate showed a more significant improvement in IOP and CMT in the suprachoroidal group as compared to intravitreal. Hence Suprachoroidal injection was seen as the treatment of choice in treatment of Diabetic Macular Edema.

Key words: Diabetic Macular Edema, Intravitreal Triamcinolone Injection, Suprachoroidal Triamcinolone Injection.

INTRODUCTION

Diabetic macular edema (DME) is one of the primary causes of visual impairment in diabetic patients. DME is manifested as increased macular thickness caused by accumulation of intra-retinal fluid primarily in inner and outer plexiform layer. This is caused by breakdown of blood retinal barrier due to prolonged hyperglycemia.¹ The prevalence rate of diabetic macular edema varies according to the type of diabetes, ranging from 4.2% -14.3% in individual with type I diabetes and 1.4% -5.57% in patients with type II diabetes.² A systemic review, which utilized optical coherence tomography (OCT) for diagnosis of DME observed global prevalence was 5.47%, 5.14% in low to middle income countries and 5.14% in high income countries.³ There are multiple modalities available for the treatment of macular edema, such as macular grid laser, sub-threshold diode laser.⁴

Beside these intravitreal steroid and anti-vascular endothelial growth factor are also found effective in treatment of DME. Recently suprachoroidal injection of triamcinolone gain popularity to treat the DME.⁵ Triamcinolone suprachoroidal injection in DME involves delivering corticosteroids directly to the suprachoroidal space, mitigating inflammation and vascular leakage.⁶ This targeted approach minimizes systemic side effects and offers potential for enhanced efficacy in managing DME.⁷ Intravitreal triamcinolone effectively treats DME by decreasing breakdown of the blood- retinal barrier, minimizing vascular leakage, inhibiting vascular endothelial growth factor, and enhancing vasoconstriction of retinal blood vessels.⁸ Intravitreal triamcinolone injection offer effective treatment for DME with potential side effects such as cataract and glaucoma.⁹ The aim of our study is to assess the efficacy of

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suprachoroidal triamcinolone injection versus intravitreal triamcinolone in diabetic macular edema.

METHODS

A prospective randomized controlled trial conducted at the Ophthalmology department of Ziauddin Hospital Kemari, Karachi over the period of one year from 1st November 2022 till 30th October 2023. The study received ethical approval (60922-23/10/22) after undergoing a comprehensive review by the institutional ethical committee. The sampling technique was non-purposive. All patients who met the inclusion criteria were included in this study after taking informed consent. We included patients in study who were diagnosed case of DME, type II diabetes, age 40-60 years and central macular thickness $\geq 300\mu\text{m}$ on optical coherence tomography(OCT). We excluded patients with history of macular grid laser, previous intravitreal anti vascular endothelial growth factor (VEGF), age related macular degeneration, proliferative diabetic retinopathy, glaucoma, cataract, uveitis and steroid responder.

All patients were randomly divided into 2 groups; group A received single dose of intravitreal triamcinolone injection 4mg /0.1 ml and group B treated with single dose of suprachoroidal triamcinolone injection 4mg/0.1 ml. All patients were assessed preoperatively on the basis of history and clinical examination. The clinical examination included base line best corrected visual acuity (BCVA), anterior segment examination, measurement of intraocular pressure (IOP), dilated fundus examination and measurement of macular thickness on OCT. The both procedures were performed in sterilized condition in the operation theater. In both groups 30 gauge needle was used to inject the drug under topical anesthesia. In group A intravitreal triamcinolone was injected 3.5 mm away from limbus in pseudophakic eye and 4mm in phakic eye. Group B was treated with suprachoroidal triamcinolone injection given 4mm away from limbus. After procedure, dilated fundus examination and IOP were conducted for all the patients, followed by prescription of topical

antibiotic for 1 week. Subsequently, patients were scheduled for follow-up visits at 1st week, 1st, 3rd and 6th month postoperatively. During each follow-up clinical examination and OCT were performed.

The data were analyzed and entered into SPSS version 23. Quantitative variables, such as age, will be presented as mean \pm standard deviation. Qualitative variables, like gender, will be presented as frequency and percentage. Comparative data will be analyzed using Chi- square test and the follow-up parameter were compared by using ANOVA test, with significance indicated by a p-value < 0.05 .

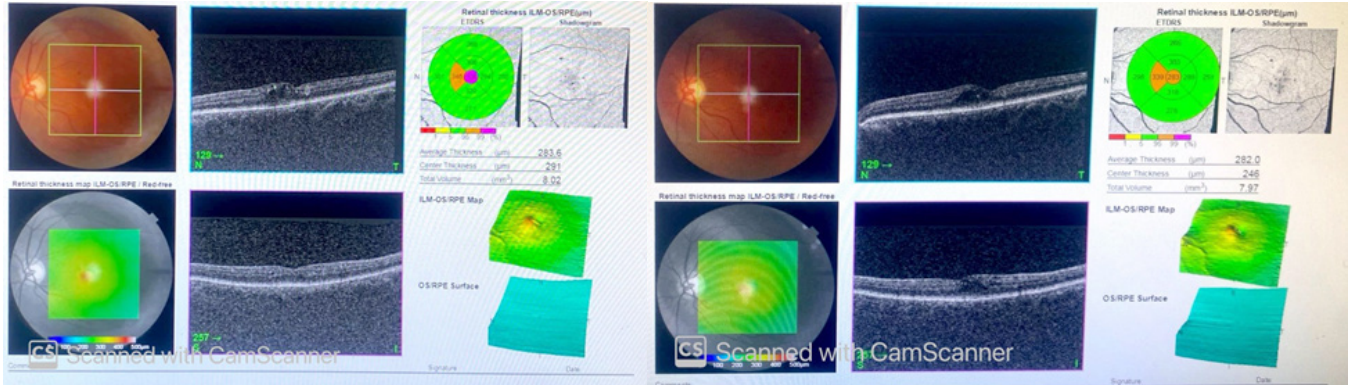
RESULTS

This study includes 71 eyes of 59 patients diagnosed with diabetic macular edema, who were divided into 2 groups on the basis of choice of treatment. The Group A comprised 34 patients, while Group B consisted of 37 patients. The mean age of patients in both groups was 43.6 ± 6.2 . In term of gender distribution, there were slight more women (54.3%, n = 32) w than men (45.7%, n= 27). The mean duration of diabetes was 12.32 ± 6.2 years in both groups. The base line visual acuity of Group A was 0.617 ± 0.058 , while Group B had a visual acuity of 0.699 ± 0.056 , as recorded on a log MAR chart. The visual acuity of group A at the first follow-up visit after 1 month showed improvement being 0.534 ± 0.053 , while group B major improvement with visual acuity 0.517 ± 0.062 . The visual acuity at 3 month follow up for group A was 0.461 ± 0.057 , whereas for group B it was 0.388 ± 0.061 . The visual acuity at the final 6 month follow –up was 0.534 ± 0.061 for group A and 0.516 ± 0.049 for group B.

The baseline macular thickness for both groups was compared pre-operatively, Group A mean came out to be 435.1 ± 58.0 , while Group B was 499.1 ± 46.4 . The macular thickness at the 1st month follow up was 306.7 ± 45.9 in group A and 300.8 ± 27.8 in group B. At 3rd month group A showed further decrease in thickness up to 286.0 ± 29.1 , while group B was 252.3 ± 14.4 . At the final 6th month follow up, group A thickness was 322.1 ± 60.2 , while group B was $293.4 \pm$

31.3. The maximal response was observed at the 3rd month follow up, this response was better sustained by suprachoroidal triamcinolone group than the intravitreal triamcinolone group. The pre and post- operative data was compared in group A and B using the paired t test. Both the visual

acuity (Table-I) and macular thickness (Table-II) were both analyzed. The ANOVA test was used to compare the outcome of both groups. The visual acuity and macular thickness were compared between both groups. (Table-III)



Picture-1. Macular thickness on OCT

(a).pre –treatment macular thickness on OC T (b) post- suprachoroidal triamcinolone OCT showing reduce macular thickness after 1 month.

Comparison of Outcome Between Pre and Post Treatment Follow up	Paired Differences					t	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
				Lower	Upper		
1 st month versus 3 rd month after intravitreal injection	.07294	.07534	.01292	.04665	.09923	5.645	.000
3 rd month versus 6 th month after intravitreal injection	-.07294	.06978	.01197	-.09729	-.04859	-6.095	.000
Pre- treatment versus 1 st month after suprachoroidal injection	.18135	.07811	.01284	.15531	.20739	14.123	.000
1 st month versus 3 rd month after suprachoroidal injection	.12892	.07531	.01238	.10381	.15403	10.413	.000
3 rd month versus 6 th month after suprachoroidal injection	-.12757	.07837	.01288	-.15370	-.10144	-9.902	.000

Table-I. Comparison of outcome of vial acuity between pre and post treatment follow up.

Pre- treatment and Post Treatment Outcome Comparison	Paired Differences					T	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
				Lower	Upper		
Pre- treatment versus 1 st month after intravitreal injection	128.44118	76.78707	13.16887	101.64890	155.23345	9.753	.000
1 st month versus 3 rd month after intravitreal injection	20.70588	38.20323	6.55180	7.37615	34.03562	3.160	.003
3 rd month versus 6 th month after intravitreal injection	-36.08824	68.22795	11.70100	-59.89409	-12.28238	-3.084	.004
Pre- treatment versus 1 st month after suprachoroidal injection	198.35135	46.59770	7.66061	182.81491	213.88780	25.892	.000
1 st month versus 3 rd month after suprachoroidal injection	48.51351	27.07256	4.45070	39.48707	57.53995	10.900	.000
3 rd month versus 6 th month after suprachoroidal injection	-41.16216	34.20649	5.62351	-52.56717	-29.75715	-7.320	.000

Table-II. (Pre –treatment and post treatment macular thickness on OCT using paired t test)

Comparison Between Groups	Sum of Square	Mean Square	F	sig
Visual acuity base line Group A versus Group B	0.072	.005	2.136	0.04
Visual acuity 1 month after treatment Group A versus Group B	0.065	.004	2.287	0.05
Visual acuity 3 rd month after treatment Group A versus Group B	0.069	.005	2.331	0.04
Visual acuity 6 th month after treatment Group A versus Group B	0.074	.006	2.652	0.02
Macular thickness on OCT Base line Group A versus Group B	78714.275	4919.642	2.569	0.03
Macular thickness on OCT 1 month after treatment Group A versus Group B	68922.118	2461.504	16.941	0.003
Macular thickness on OCT 3 rd month after treatment Group A versus Group B	18986.387	1186.649	2.212	0.05
Macular thickness on OCT 6 th month after treatment Group A versus Group B	67571.426	6757.143	2.981	.015

Table-III. ANOVA used to compare inter group visual acuity and macular thickness

DISCUSSION

Diabetic macular edema (DME) can be effectively managed through various treatment modalities including grid laser, sub-threshold laser and intravitreal anti-vascular endothelial growth factor (anti-VEGF) injection.¹⁰ More recently, the use of intravitreal and suprachoroidal Triamcinolone Acetonide has become increasingly popular as these injections are less costly and significantly reduce the macular edema. Triamcinolone injection act as anti-inflammatory substance and inhibit the vascular endothelial growth factor.¹¹

Various studies have discovered that both intravitreal triamcinolone and suprachoroidal injections are effective in treating DME. However, suprachoroidal injections are considered superior to intravitreal due to its longer duration of effectiveness and fewer side effects such as glaucoma and cataract.¹²

Sheikh et al in his study, observed 34 patients with resistant diabetic macular edema. They were divided into two groups, group A for intravitreal injection while group B was suprachoroidal. At 1 month follow up the comparison between BCVA, CMT and IOP of both groups were not significant. At the 3rd month follow up both groups were seen equally effective but group B showed a more stable IOP than group A. At the 6th month follow up both groups were equally effective in BCVA and CMT but the IOP was significantly decreased in group B.¹³

In a similar study, Tabl et al studied 23 eyes of 23 patients, which were divided into 2 groups, SCTA and IVTA. There was no significant difference in

BCVA between the two groups at baseline, 1st month and 3rd month. The SCTA group showed a significant overall improvement after 3 months. The CMT showed no significant differences between the two groups at baseline and 1st month. The CMT for SCTA group showed overall reduction at 3rd month and was seen significantly lower than IVTA group. The IOP was also seen significantly higher in IVTA group at 3rd month. The overall comparison showed that IVTA had a significantly higher recurrence rate than SCTA at after 3 months with SCTA being 30.8% and IVTA 70%.¹⁴

Zakaira et al conducted a comparative study on 45 eyes of 32 patients, who were divided into 3 groups, group A was intravitreal TA 4mg, group B was suprachoroidal TA 4mg, group C was suprachoroidal TA 2mg. The first month follow up showed maximum reduction in CMT and improvement of BCVA in all 3 groups. The 3rd month followup showed further reduction in CMT of group B while the rest were not statistically significant. The same was seen in 6th month were the CMT and BCVA for group B showed improvement.¹⁵

Khan et al conducted a experimental study on 64 eyes, which were divided into SCTA and IVTA groups. There were significant improvement in BCVA and reduction in CMT seen in both groups. The SCTA group showed more substantial visual acuity improvements as compared to IVTA group. The IOP was seen reduced in the SCTA group at 1sy week follow up while there was a significant increase in the IOP of IVTA group.¹⁶

Our group showed similar results, where we compared 71 eyes of 59 patients diagnosed with diabetic macular edema. They were divided into group A, suprachoroidal and group B, intravitreal. The visual acuity of both groups had showed marked improvements being equally effective as compared to baseline. The comparison of Macular thickness showed improvement at the follow up visits with suprachoroidal group showing more substantial improvement as compared to intravitreal group. The IOP for both showed improvement in the early follow up visits. The suprachoroidal group showed continuous improvement in the later follow ups as well, while the intravitreal group showed a significant increase in IOP.

CONCLUSION

Our study shows that both suprachoroidal and intravitreal Triamcinolone Acetonide are equally effective in treatment of Diabetic Macular Edema. However the Suprachoroidal group was seen more effective in management of IOP as compared to intravitreal. Suprachoroidal was seen as the treatment of choice due to its longer duration of action and lesser side effects such as glaucoma and cataract as compared to intravitreal.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Amber Khalid	Concept, design, and main contributor in writing the manuscript, Interpretation of data, Statistical analysis and performed surgeries.	
2	Aveen Fatima	Literature research for discussion, statistical analysis and references.	