

# The Relationship between Intraocular Pressure and Choroid Thickness after Intravitreal Injection in Patients with Diabetic Macular Edema

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## ABSTRACT

**Objective:** To investigate the relationship between Intraocular Pressure (IOP) change and choroid thickness in the early period after intravitreal injection in Diabetic Macular Edema (DME)

**Materials and Methods:** The patients with were treated intravitreal anti-VEGF for DME were included in the study. The age, sex, Preinjection (PRI) IOP, Postinjection (POSI) day one, week one IOP values, choroid thickness. The presence of Subconjunctival Reflux (SR) during injection, complications, and anterior chamber paracentesis was noted.

**Results:** 73 patients were included in the study. IOP mean of PRI, POSI 1 day, and POSI 1 week were  $15,76 \pm 3,33$  mmHg,  $17,18 \pm 4,02$  mmHg ,  $15,57 \pm 3,76$  mmHg, respectively. There was a difference between POSI 1 day with PRI and POSI 1 week for IOP. There was no difference between PRI IOP with POSI 1 week. Choroidal thickness was PRI, POSI 1 Day and POSI 1 week  $260 \pm 100.4$   $\mu$ m  $256.5 \pm 96.5$   $\mu$ m,  $258.6 \pm 104.5$   $\mu$ m respectively. There was no relationship between the pressure change and CT in patients but CT was measured as the thinnest in the patients at 1st day while IOP was higher. IOP values on day one POSI were  $15.27 \pm 3.41$  mmHg with SR and lower than without SR IOP values  $18.25 \pm 4.09$  mmHg on day one POSI and statistically significant. No difference was found between the choroidal thicknesses of the patients with and without SR.

**Conclusion:** The choroid was found to be thicker in individuals with increased IOP increase but not statistically significant.

## Keywords

Choroidal thickness; Intraocular pressure; Anti VEGF

## Introduction

Diabetic Retinopathy (DR) and DME are one of the most important causes of blindness. The most effective treatment, for now, is systemic regulation of diabetes, but the systemic regulation is not enough to reduce the retinopathy and DME. Macular laser photocoagulation has been the recommended treatment method. However, to eliminate the increase in diabetic

neovascularization and increased permeability, anti-VEGFs are actively used and are even preferred to the laser [1-3].

Increased IOP in intravitreal injections has been frequently discussed in the literature [4,5]. In some studies in the literature, especially in patients with narrow-angle glaucoma, the choroid is thicker [6], although the choroidal thickness decreases with the increase in

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intraocular pressures [7]. In some studies, no relation was found between choroidal thickness and ocular blood pressure [8,9]. However, as far as we know, there is no paper investigating the relationship between choroidal thickness and intravitreal injection of IOP in diabetic patients.

Our study aimed to investigate the relationship between early IOP exchange and CT after intravitreal injection in patients with DME.

### Methods

The study is a retrospective study. Between 2017 and January 2018, 73 eyes of 73 patients were included in the study in our clinic and they were diagnosed as DME and intravitreal anti-VEGF (Eylea) (VEGF Trap-Eye; Regeneron, Inc., Tarrytown, NY, USA, and Bayer Healthcare Pharmaceuticals, Berlin, Germany). The study was based on the Helsinki criteria. Patients with glaucoma, glaucoma medication, and patients with ocular hypertension, multiple intravitreal injections, severe nonproliferative diabetic retinopathy, proliferative retinopathy, retinal or macular laser treatment, intraocular surgery, patients with retinal disease other than DME and DR, the patients previously injected intravitreal anti-VEGF into the other eye, the patients who had phaco or vitrectomy surgery within one year and had a high refractive error (myopia, hypermetropia) were not included in the study.

Patient files were scanned. Age, gender, PRI IOP, POSI 1 day, 1 week IOP values, PRI and POSI 1 day and 1 week CT, presence of SR during injection, presence of complications during or after injection, and presence of anterior chamber paracentesis were noted.

CT thickness was measured SD-OCT (OptiVue 2800 Bayview Drive Fremont, CA 94538, The USA), as previously described in the

literature [10].

IOP was measured with Goldman applanation tonometry. To avoid diurnal variation, IOP measurements between 9-17 am before and after injection was noted.

Intravitreal injections were performed by the same eye specialist.

### Statistics

The descriptive data are presented as the mean Standard Deviations (SD) Paired t-tests were used to determine whether differences over time were significant. The correlations between the CT and IOP were determined by Spearman rank correlations. p-value <0.05 was considered significant.

### Results

The characteristics of the patients are summarized in **Tables 1 and 2**.

73 eyes of 73 patients in our clinic were included in the present study. 37 were male and 38 were female.

No, the relationship was found between age and sex of patients with a change of IOP ( $p > 0.05$ ). There was a statistically significant difference between the IOP value of patients with PRI IOP value and the IOP value measured on the first day ( $p < 0.05$ ). There was no statistically significant difference between first-week POSI IOP value and PRI IOP value ( $p > 0.05$ ). There was a difference between POSI 1 week IOP value and POSI 1 day IOP value, POSI 1 week IOP value was lower ( $p < 0.05$ ).

SR was not seen in all 28 patients. IOP values measured on the first day were lower with SR than those without SR and this was statistically significant ( $p < 0.05$ ). However, this difference was not observed in the 1<sup>st</sup> week.

**Table 1: IOP values and CT thickness.**

	Pre injection	Post inection 1 day	Post injection 1 week
<b>IOP Value mmHg</b>	15,76 ± 3,33	17,28 ± 4,02	15,57 ± 3,76
<b>Choroid Thickness µm</b>	260 ± 100.4	256.5 ± 96.5	258.6 ± 101.5

IOP: Intraocular Pressure; CT: Choroid Thickness

**Table 2: IOP values and SR.**

	Pre injection IOP	Post inection 1 day IOP	Post injection 1 week IOP
<b>Subconjunctival Reflux -</b>	15,56 ± 3,40	18.25 ± 3.09	15,80 ± 3,53
<b>Subconjunctival Reflux +</b>	15,27 ± 3,38	15.69 ± 3.41	15,72 ± 3,35

IOP: Intraocular Pressure; SR: Subconjunctival Reflux

No statistically, a significant difference was found between 1 day, 1 week and PRI CT values ( $p>0.05$ ). Although it is not statistically significant the POSI 1 day IOP value was the highest while CT values were thinnest.

No correlation was found between the presence of SR and choroidal thickness.

Visual acuity was  $0.3 \pm 0.16$ ,  $0.39 \pm 0.10$  according to Snellen chart before and after injection at first week, respectively. No correlation visual acuity before and after injection was found between the presence of SR, choroidal thickness and IOP.

No complication was observed in any of the patients and no anterior chamber paracentesis was performed in any patient.

## Discussion and Conclusion

When the present study results are examined, IOP increases on the first day after intravitreal injection and the POSI 1 week IOP and PRI IOP values are similar to the measured values. SR seems to be an important factor in IOP regulation.

In literature, it was reported that post-injection IOP was more in injections with a smaller needle tip and tunnel technique [11,12]. SR was not seen in all 28 patients, although we performed all the patients with the same intravitreal agent on their needle. As the study is a retrospective study, it is not known exactly what technique the injection was made because the technique was not mentioned in the file data. This is one of the limiting factors for us to get used to. But the lack of SR may suggest the assumption that tunnel technique is used. Therefore, as mentioned in the literature, the tunnel technique IOP raises.

In the present study, although is not statistically significant the POSI 1 day IOP value was highest while CT values were thinnest. But there was no relationship between IOP values and choroidal thicknesses before and after the injection. In literature, there was no correlation between IOP

and choroidal thickness in healthy individuals [13] Diabetic patients who did not develop diabetic retinopathy had no difference in terms of CT compared to the normal population [14].

There are similar studies in the literature. Choroidal thickness decreases with IOP reduction in patients undergoing trabeculectomy surgery [15-17].

Decreased IOP during vitrectomy and choroidal thickness follow-up in patients with ILM and ERM peeling increased during follow-up [18,19]. In our study, the choroid was thinner in patients with high IOP, but there was no statistically significant difference.

Intravitreal injection trabeculectomy is not penetrating surgeries, such as vitrectomy, and may not influence eye blood flow and inflammatory processes as well as other surgeries [20,21].

The other limiting factors in our study are that CT is different in men and women [22] and changes in the dynamics of CT during the treatment of retinal diseases [23,24]. If there were studies with healthy individuals and single-gender, different results could be obtained.

The advantage of our study is that the degree of DME and the severity of DRP are close to each other. Therefore, a homogeneous group could be formed in terms of the abovementioned restrictions.

IOP changes after intravitreal injections affect CT, although not statistically significant. One of the most important reasons for the increase in pressure is SR. One of the limiting factors in the study was that it was a retrospective study. Long-term follow-up of some patients could not be achieved. In some patients, there was a significant deterioration of the systemic condition. Long-term results may also be valuable if a systemic condition is similar and homogeneous. Long-term follow-up and a large number of patients are needed to understand the issue completely.

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