



## Assessment of the Visual outcome and Central macular thickness after laser Photocoagulation in patients with Early Proliferative Diabetic retinopathy without Diabetic macular Oedema

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### Abstract

#### Purpose:

- 1.To determine the Central macular thickness in patients after laser Photocoagulation
- 2.To assess the visual outcome in patients after laser Photocoagulation

#### Materials and Methods:

This was a prospective study conducted at a tertiary care hospital. A total of 19 patients (32 eyes) with Early Proliferative Diabetic retinopathy without Diabetic macular Odema who visited the Ophthalmology department were enrolled in the study after obtaining informed consent. The study adhered to the tenets of the Declaration of Helsinki. BCVA was recorded using a log Mar chart. Slit-lamp examination of Anterior segment, Fundus examination was done. A double frequency Nd-YAG laser (532nm) was used for PRP. The CMT was captured using OCT at baseline,1 week, 1 month after PRP and were compared.

**Results:** A total of 19 patients (32 eyes) who were diagnosed with Early proliferative Diabetic Retinopathy were analyzed. The mean age was  $50.32 \pm 7.832$  years. There were 17 males and 2 females. BCVA and CMT were compared from baseline to 1 week, baseline to 1-month post-laser. There was a reduction in BCVA from baseline to 1 week (p-value- 0.000) which was statistically significant. But the BVCA improved after laser over 1 month (p-value -0.344). There was an increase in CMT from baseline to 1 week ( p-value- 0.001)which was statistically significant. But the CMT reduced to baseline after laser over 1 month (p-value -0.927) which is not statistically significant.

**Conclusion:** Laser photocoagulation helps in preventing the progression of the proliferative Diabetic retinopathy without affecting the vision significantly, it causes transient macular edema without affecting the long-term visual outcome.

**Keywords:** Proliferative Diabetic retinopathy-PDR, DME- Diabetic macular edema, OCT -optical coherence Tomography, BCVA- Best-corrected visual acuity, CMT- central macular thickness

### INTRODUCTION

Diabetes Retinopathy is the leading cause of blindness worldwide.<sup>1</sup>. Panretinal photocoagulation (PRP) is performed as a standard treatment for proliferative diabetic retinopathy (PDR). Panretinal

photocoagulation (PRP) is a mainstay of therapy for retinal ischemic disease. The procedure involves creating thermal burns in the peripheral retina leading to tissue coagulation, the overall consequence of

which is improved retinal oxygenation.<sup>2</sup> It reduces the risk of severe vision loss which was demonstrated by the Diabetic Retinopathy Study and the Early Treatment Diabetic Retinopathy Study (ETDRS)<sup>3,4,5</sup>. Our study aimed to determine the central macular thickness and visual outcome after laser Photocoagulation. To achieve this objective the central macular thickness was compared between baseline and 1 week and 6 weeks after PRP completion by Topcon Maestro Spectral Domain Ocular Coherence Tomography (OCT)

## Materials and Methods:

### Study design

This was a prospective study conducted at a tertiary care hospital. A total of 19 patients (32 eyes) with Early proliferative Diabetic Retinopathy who visited the Ophthalmology department were enrolled in the study after obtaining informed consent. The study adhered to the tenets of the Declaration of Helsinki. The study was conducted from March 2019 to February 2020 for 12 months. Best-corrected visual acuity (BCVA) was recorded using the Log Mar chart. Intra-ocular pressure (IOP) was measured using Applanation Goldmann's tonometer. Slit-lamp examination of an Anterior segment and Fundus examination was done Indirect Ophthalmoscope. Fundus photography was captured. Double frequency Nd-YAG laser (532nm) was used for laser photocoagulation. The central macula thickness was captured using Topcon Maestro Spectral Domain Optical Coherence Tomography (OCT) at the baseline, 1 week, and 1month after Pan Retinal Photocoagulation (PRP) and was compared.

### Laser photocoagulation technique

Laser photocoagulation was performed with Double frequency Nd-YAG laser (532nm) using Volk Quadraspheric contact lens under topical anesthesia 1 % Proparacaine Hydrochloride. The laser was done in 3 sittings 1 week apart. Starting with the inferior quadrant, beyond the vascular arcade, with one burn width apart. The duration of the laser was 100 milliseconds, an average number of spots-1800-2000, Size of spot- 300 $\mu$ , the burns were titrated accordingly till Greyish white burns were appreciated.

### Patient eligibility

All the patients with type 2 diabetes diagnosed with Early PDR without Diabetic macula edema were involved in the study. Early proliferative Diabetic Retinopathy is defined as New vessels less than one-third the disc diameter, without any vitreous hemorrhage, sub hyaloid hemorrhage. Inclusion criteria were patients with Age > 20 years, clear media, BCVA of 6/18 or better. Exclusion criteria were patients with media opacity due to cataract/corneal opacity, vitreous hemorrhage, clinically significant macular edema, ischemic maculopathy, Vitreomacular traction.

### Statistical methods

All the statistical analyses of the data were analyzed in SPSS 18.0 version software. All the quantitative variables such as age, central macula thickness were expressed as mean and standard deviation with interquartile range. Differences in the BCVA and central macula thickness levels in pre laser and post-laser 1 week, 1 month were tested for statistical significance by employing paired t-test and Pearson's correlation value obtained (P-value). Similarly, all the qualitative parameters such as age, gender, duration of diabetes, were expressed as percentages along with 95% confidence intervals.

**Results:** A total of 19 patients, with 32 eyes who were diagnosed with Early proliferative Diabetic Retinopathy were analyzed. Age, sex, occupation, duration of diabetes, were analyzed. BCVA and central macula thickness were compared from baseline to 1 week, baseline to 1-month post laser photocoagulation. The Age and gender distribution are as shown in Table 1. The mean age was 50.32 $\pm$ 7.832 years. There were 17 males and 2 females with the male preponderance.

In the occupation history, we found that 6(31.57 %) of them were drivers(auto/cab) who require good quality of vision for their profession. Five (26.31%) were businessmen, 4 were (21.05 %) were farmers, 2 (10.52%)were retired officials, and 2(10.52%) female patients were homemakers as shown in table 2. Most of the patients were from lower socioeconomic status.

We found that 36.84 % of patients had a duration of diabetes less than five years,26.31 % had a duration of 6- 10 years, 36.84% had a duration of 6-10 years of diabetes as shown in table 3

We found that 21( 65.62 %) patients had a baseline BCVA of 6/12- 6/18 ( log Mar - 0.00-0.2). After 1 week 16(50%) patients had BCVA of 6/12- 6/18,(log Mar - 0.00-0.2). After 1 month of laser photocoagulation 21( 65.62 %) patients had a BCVA of 6/12- 6/18 ( log Mar – 0.00-0.2).

Mean BCVA at baseline is  $0.2656 \pm 1095$  ,at 1 week  $0.3469 \pm 0.1759$  , at 1 month  $0.2812 \pm 0.16350$ . Comparison of BCVA was done using paired sample T-test, the p-value was calculated for statistical significance. There was a reduction in BCVA from baseline to 1 week ( p-value- 0.000)which was statistically significant. But the BVCA improved after laser over 1 month (p-value -0.344)

we found that 18(56.25%) patients had CMT of 200-250 microns. After 1 week,14(43.75%) patients had 200- 250 microns, after 1 month 17(53.12%)patients had CMT of 200- 250 microns

Mean CMT at baseline was  $230 \pm 20.98$  microns, at 1 week  $243.59 \pm 28.148$  microns, 1month  $230.31 \pm 27.164$  microns. Comparison of mean CMT was done using paired sample T-test and p-value was calculated for statistical significance. There was an increase in CMT from baseline to 1 week ( p-value- 0.001)which was statistically significant. But the CMT reduced to baseline after laser over 1 month (p-value - 0.927) which is not statistically significant. Hence there was transient thickening of the macula, at 1 week, and then the CMT returned to baseline values.

### Discussion:

In our study, we found that there were 17 males and 2 females with the male preponderance. Most of the patients, males (68.4 %) and females (10.5 %) were in the age group of 41- 60 years. The mean age of the patients was  $50.32 \pm 7.832$  years.

Soman et al found that the mean patient age was  $56.47 \pm 6.55$  years.<sup>6</sup> Bobbli et al reported that the patient's age ranged from 55 years to 72 years. The mean age was 63.667 years (std. deviation 5.483) <sup>7</sup>.

In our study, we found that 21(65.62 %) patients had a baseline BCVA of 6/12- 6/18 (log Mar – 0.00-0.2). After 1 week 16(50%) patients had BCVA of 6/12- 6/18. ((log Mar – 0.00-0.2). After 1 month of laser photocoagulation, 21(65.62 %) patients had a BCVA of 6/12- 6/18 (log Mar – 0.00-0.2) as shown in table 4. Mean BCVA at baseline is  $0.2656 \pm 1095$ , at 1 week

$0.3469 \pm 0.1759$ , at 1 month  $0.2812 \pm 0.16350$ . There was a reduction in BCVA from baseline to 1 week ( p-value- 0.000)which was statistically significant. But the BVCA improved after laser over 1 month (p-value -0.344).

Mukhtar et al found that mean pretreatment BCVA was  $0.67 \pm 0.43$  and mean post-treatment BCVA was  $0.57 \pm 0.3$ <sup>8</sup>

In our study, we found that 18(56.25%) patients had baseline central macular thickness (CMT) of 200- 250 microns. After 1-week post laser, 14(43.75%) patients had CMT of 200- 250 microns, after 1 month 17(53.12%) patients had CMT of 200- 250 microns as shown in table 5. Mean CMT at baseline was  $230 \pm 20.98$  microns, at 1 week  $243.59 \pm 28.148$  microns, at 1month  $230.31 \pm 27.164$  microns. There was an increase in CMT from baseline to 1 week ( p-value- 0.001)which was statistically significant. But the CMT reduced to baseline after laser over 1 month (p-value -0.927) which is not statistically significant. Hence there was transient thickening of the macula, at 1 week, and then the CMT returned to baseline values.

Mukhtar et al reported that mean central macular thickness (CMT)as measured by OCT was  $391.93 \pm 170.43$  before treatment and  $316.91 \pm 90.42$  microns after treatment. The magnitude of induced change in CMT after treatment was  $75.01 \pm 90.75$  and BCVA was  $0.09 \pm 0.14$ .10. This was similar to our study, were in our study patient regained vision at 1 month.<sup>8</sup>

A study conducted by Shimura et al found that Macular thickness was increased transiently in the central macula in both eyes, more in the weekly treated eyes, and then decreased to control levels in eyes treated biweekly but remained thickened in eyes treated weekly.<sup>9</sup>

In a study done by sang hoon park et al, in patients with severe diabetic retinopathy treated with panretinal photocoagulation, mean visual acuity did not decrease significantly but mean central and peripheral macular thickness significantly increased after treatment. They found that the visual prognosis after panretinal photocoagulation in eyes with severe diabetic retinopathy without macular edema is influenced by the control of blood glucose and blood pressure and the presence of diabetic nephropathy.<sup>10</sup>

**Conclusion:** Laser photocoagulation helps in preventing the progression of the proliferative

Diabetic retinopathy without affecting the vision significantly, it causes transient macular edema without affecting the long-term visual outcome. It is an effective procedure in preventing the complication of diabetic retinopathy.

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*Figure 1: Fundus photo of the right eye and left eye showing early PDR*



**Table 1: Age and gender distribution**

Age in years	Male (N)(%)	Female(N)(%)
20 – 40	2 ( 10.5)	0
41- 60	13(68.4)	2( 10.5)
>61	2 (10.5)	0
Total 19	17( 89.47)	2( 10.5)

**Table 2: Occupation of patients**

Occupation	Number(N)	Percentage( %)
Drivers	6	31.57
Businessmen	5	26.31
Farmers	4	21.05
Retired officials	2	10.52
Homemakers	2	10.52
<b>Total</b>	<b>19</b>	<b>100</b>

**Table 3: Duration of diabetes**

Duration of diabetes(years)	Number(N)	Percentage( %)
0-5	7	36.84

6-10	5	26.31
11-15	7	36.84
<b>TOTAL</b>	<b>19</b>	<b>100</b>

**Table 4: Visual acuity before and after laser photocoagulation**

BCVA - Log Mar	Baseline BCVA	Post laser BCVA (1week)	Post laser BCVA (1month)
	Number(N) Percentage( %)	Number(N) Percentage( %)	Number(N) Percentage( %)
0.00- 0.2	9 (21.92%)	7( 21.87 %)	8( 25%)
0.3-0.4	21( 65.62 %)	16(50%)	21( 65.62%)
0.4	2( 6.25%)	9(21.92%)	3( 9.37 %)
TOTAL -32	32(100%)	32(100%)	32 (100%)

**Table 5: Central macular thickness before and after laser photocoagulation**

CMT (microns)	Base line CMT	Post laser CMT(1week)	Post laser CMT(1month)
	Number(N) Percentage (%)	Number(N) Percentage (%)	Number(N) Percentage (%)
< 200	2(6.25%)	1(3.125%)	1(3.12%)
200- 250	18(56.25%)	14(43.75%)	17(53.12%)
251-300	10(31.25%)	15(46.87%)	13(40.62%)
>300	1(3.125%)	2(6.25%)	1(3.12%)