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### A Study on Clinical Effects of Grid Laser Photocoagulation in Diabetic Maculopathy

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#### Abstract

**Purpose:** To assess the clinical effects of Grid laser photocoagulation in Diabetic macular edema.

**Materials & Methods:** A total of 100 eyes of 50 patients with Diabetic Macular edema attending the Department of Ophthalmology at Rajah Muthiah Medical College and Hospital, Chidambaram were the target population of the study. Visual acuity for all patients was evaluated by Snellen's chart. Baseline BCVA was  $\geq 6/60$ . Macular Grid laser photocoagulation was done for all the patients using 532nm Diode pumped solid state laser (DPSS) delivered by Slit lamp by modified ETDRS criteria. Patients were followed up for a period of 3 months.

**Results:** Among the 50 patients 26 were Male (52%) and 24 were Female (48%). The mean age of the study population was 55yrs. The mean BCVA BE of the patients; Pre & Post laser showed no change (p > 0.5). On 3 month follow up, 86% of eyes had a stable vision, 4% had improved vision of 1 line and 10% showed decreased vision of 1 line in Snellen's chart.

**Conclusion:** Diabetic macular edema is a potentially sight threatening complication of people affected by DM worldwide. Grid laser photocoagulation reduces the risk of moderate vision loss when treated early. **Keywords:** Grid laser photocoagulation, Diabetic macular edema, clinically significant macular edema, Diabetes mellitus.

#### Background

Diabetes mellitus (DM) is a global epidemic with significant morbidity. Diabetic retinopathy (DR) & Diabetic macular edema (DME) are the specific microvascular complication of DM and affects 1 in 3 persons with DM. DR/DME remains a leading cause of vision loss in working adult populations<sup>1</sup>.

According to the WHO, 31.7 million people were affected by diabetes mellitus (DM) in India in the year 2000. This figure is estimated to rise to 79.4 million by 2030, the largest number in any nation

in the world. In 2014, The All India Ophthalmological society reported that approximately 21.7% of patients with diabetes had  $DR^2$ . Macular oedema increases 3% in moderate NPDR, 38% in severe NPDR and 71% in PDR.

Epidemiological studies and clinical trials have shown that Diabetic macular edema results in irreversible loss of vision and is the major cause of visual morbidity in patients with Diabetes of adult onset. To date, the most effective means to reduce the risk of vision loss from DME includes focal/grid laser photocoagulation and intensive blood sugar control. In Early Treatment Diabetic Retinopathy study (ETDRS), Focal/Grid Laser photocoagulation of eyes with diabetic macular edema (DME) reduced the risk of moderate visual acuity loss (defined as a loss of 15 or more letters) by approximately 50%. One of the major findings in the ETDRS study was that laser photocoagulation helped stabilised vision in majority of the patients<sup>3,4</sup>.

Clinically significant macular edema (CSME)/ Diabetic macular edema (DME) [ETDRS Classification]

- Thickening of the retina< 500 microns from the center of the macula.
- Hard exudates with thickening of the adjacent retina located 500 microns from the center of the macula.
- A zone of retinal thickening, 1 disc area or larger in size located 1 disc diameter from the center of the macula.

### ICO Guidelines

International council of Ophthalmology (ICO) in its guidelines for 2017 has further classified DME as follows<sup>1</sup>

Diabetic macular edema	Findings observed on dilated Ophthalmoscopy		
No DME	No retinal thickening or hard exudates in the macula		
Non control involved DME	Retinal thickening in the macula that does not involve		
INOIL CEITUAI-IIIVOIVEU DIVIE	the central subfield zone that is 1mm in diameter		
Control involved DME	Retinal thickening in the macula that involves the		
	central subfield zone that is 1mm in diameter		

#### **Materials and Methods**

The aim of this study is to observe the effects of Grid laser photocoagulation in eyes with clinically significant macular edema.

In this Prospective clinical study 100 eyes of 50 patients attending the Department of Ophthalmology at Rajah Muthiah Medical College and Hospital, Chidambaram from October 2017 to September 2018 with Diabetic macular edema was included.

### **Inclusion criteria**

- Patients with Non Proliferative Diabetic Retinopathy with Diabetic Macular edema
- Best corrected visual acuity ≥ 6/60 using Snellen's chart.

**Exclusion criteria:** Patient with Diabetic Macular edema having

- Retinal thickening from epiretinal membranes or vitreomacular traction
- Had YAG capsulotomy within 2 months.
- Major ocular surgery including cataract surgery within the prior 6 months.
- Patients with Proliferative diabetic retinopathy.

Visual acuity for all patients were evaluated by Snellen's chart.

The patients were then examined under Slit lamp Biomicroscope to rule out anterior segment diseases that could alter visual outcome.

The posterior segment was examined with an Indirect Ophthalmoscope and 20D lens with a fully dilated pupil and were diagnosed according to the ETDRS classification for CSME/DME.

IOP was checked using TOPCON non-contact tonometer.

Basic clinical investigations for assessing the current diabetic status of the patients were done.

Patients were then treated with IRIDEX OCULIGHT-GL DPSS Grid Laser photocoagulation delivered by Slit lamp using Volk Centralis, HPF magnifying contact lens under LA in the Department of Ophthalmology at Rajah Muthiah Medical College and Hospital after obtaining informed written consent.

Grid Laser photocoagulation was done in a single sitting for all study population on an outpatient basis.

Laser settings

- Duration- 100- 200ms
- Spot size- 50 100 microns
- Power 150-300 mJ

#### Results

 Table 1 Age-wise Distribution

- Intensity-mild to moderate
- 1 burn width apart, 500µ from centre of macula and 500µ from temporal margin of disc

Patients were followed up for a period of 3 months post treatment and VA recorded using Snellen's chart and corresponding ETDRS score was assigned for the purpose of statistical analysis.

#### Statistical analysis

All the data was entered into Microsoft Excel Sheet and statistical analysis was arrived by using IBM SPSS software version 22. All the data was presented as mean, standard deviation and percentage. Chi-square test was done to evaluate statistical significance. Wilcoxon signed ranks test was done to assess the outcome of the treatment.

Age distribution	No of Patients	Percentage
30-40	3	6.0
41-50	14	28.0
51-60	20	40.0
61-70	12	24.0
71-80	1	2.0
Total	50	100.0

Most of the patients in the study were in the age group of 51-60 yrs (40%)

#### Table 2 Sex Distribution

Sex	No of patients	Percentage
Female	24	48.0
Male	26	52.0
Total	50	100.0

The study population had 26 Male patients (52%) and 24 female patients (48%).

#### Table 3 Duration of DM

Duration of DM	No. of patients	Percentage
<5	18	36
6-10	21	42
11-15	4	8
16-20	6	12
21-25	1	2
Total	50	100

In the present study the mean duration of DM was 6-10yrs in 21(42%) patients, followed by <5yrs in 18(36\%); 16-20yrs in 6(12\%); 11-15yrs in 4(8\%) and 21-25yrs in 1(2\%)

Prelas		laser	3 month follow up	
всуа	No of eyes	Percentage	No of eyes	Percentage
6/60	2	4	3	6
6/36	13	26	13	26
6/24	8	16	7	14
6/18	8	16	8	16
6/12	8	16	9	18
6/9	9	18	9	18
6/6	2	4	1	2
Total	50	100	50	100

**Table 4** Comparison of Pre/Post Laser BCVA RE

In the above table on comparison of BCVA RE Pre/Post laser indicates that majority of the eyes had a stable vision; 42/50 (84%) post treatment.

Fig 1 Comparison of Pre/Post Laser BCVA RE



Table 5 Chi-Square test RE

ETDDS Seeme	Moon	SD	Paired sam	ple test
ETDRS Score	wiean	SD	't'value	'p'value
RE Prelaser	59.60	13.12	1.21	107
RE Postlaser	58.90	13.14	1.51	.197

The mean ETDRS score of RE Prelaser was  $59.60 \pm 13.12$  and Post laser was  $58.90 \pm 13.14$ . But the difference was insignificant (p>.05) which implies that the vision remained stable post treatment.

#### Table 6 Wilcoxon Signed Ranks Test RE

BCVA Pre/Post Laser RE	Ν
Negative Ranks	6
Positive Ranks	2
Ties	42
Total	50

In our study, on comparison of Pre & Post laser BCVA of RE, 42 (84%) eyes had stable vision post laser treatment, 2 (4%) eyes showed improvement of vision and 6 (12%) eyes showed worsening of vision.

DOVA	Pre	aser	3 month follow up		
всуа	No of eyes	Percentage	No of eyes	Percentage	
6/60	1	2	2	4	
6/36	13	26	14	28	
6/24	9	18	7	14	
6/18	8	16	8	16	
6/12	10	20	10	20	
6/9	6	12	6	12	
6/6	3	6	3	6	
Total	50	100	50	100	

 Table 7 Comparison of Pre/Post Laser BCVA LE

The above table implies that on comparison of BCVA of LE Pre/Post laser treatment majority of eyes44/50(88%) had a stable vision post treatment.

Fig 2 Comparison of Pre/Post laser BCVA LE



Table 8 Chi-Square test LE

ETDRS Score	Mean	SD	Paired san	nple test
LIDROBEOIC	wican	50	't'value	'p'value
RE Prelaser	60.00	12.78	0.04	0.25
RE Postlaser	59.60	13.09	0.94	0.35

The mean ETDRS score of LE Prelaser was  $60.00 \pm 12.78$  and Post laser was  $59.60 \pm 13.09$ . But the difference was insignificant (p value >.05) which implies that the vision remained stable after laser treatment.

**Table 9** Wilcoxon Signed Ranks Test LE

BCVA PRE/POST Laser LE	Ν
Negative Ranks	4
Positive Ranks	2
Ties	44
Total	50

In our study, on comparison of Pre & Post laser BCVA of LE, 44 (88%) eyes had stable vision post laser treatment, 2 (4%) eyes showed improvement of vision and 4 (8%) eyes showed worsening of vision.

The mean age of the patients in the study was 55yrs. Most of the patients in the study were in the age group of 51-60 yrs (40%).

The study population had 26 Male patients (52%) and 24 female patients (48%).

The mean duration of DM in the patients included in our study was 6-10 yrs (42%).

The mean ETDRS score RE was  $59.60 \pm 13.14$ and LE was  $60.00 \pm 12.78$  in the study population before laser treatment. On 3 month follow up, the mean ETDRS score RE was  $58.90 \pm 13.14$  and LE was  $59.60 \pm 13.09$ . On comparison by Chi-Square test the data was clinically insignificant in both eyes (p>0.5). The result indicates that most of the patients had a stable vision post laser treatment.

#### Discussion

On comparison of Pre/Post laser BCVA of the study population, a total 86% of eyes had stable vision following Grid laser treatment in our study as compared to 77% in McDonald, Schatz<sup>5</sup> et al; 86% in Laursen<sup>6</sup> et al; 77% in Lee, Olk<sup>7</sup> et al; 88% in Akduman, Olk<sup>8</sup> et al; 65% in Tewari<sup>9</sup> et al; 76% in Shahid MJ<sup>10</sup> et al;42% in Masahiko S<sup>11</sup> et al; 50% in Scott U<sup>12</sup> et al.

A total of 4% of eyes had improved vision in our study which was lower as compared to 17% in McDonald, Schatz<sup>5</sup> et al; 5% in Laursen<sup>6</sup> et al; 14% in Lee, Olk<sup>7</sup> et al; 8% in Akduman, Olk<sup>8</sup> et al; 20% in Tewari<sup>9</sup> et al; 11% in Shahid  $MJ^{10}$  et al;45% in Masahiko S<sup>11</sup> et al; 18% in Scott U<sup>12</sup> et al.

A total of 10% eyes had worsening of vision in our study as compared to 6% in McDonald, Schatz<sup>5</sup> et al; 9% in Laursen<sup>6</sup> et al; 9% in Lee, Olk<sup>7</sup> et al; 4% in Akduman, Olk<sup>8</sup> et al; 15% in Tewari<sup>9</sup> et al; 13% in Shahid  $MJ^{10}$  et al; 11% in Masahiko S<sup>11</sup> et al; 32% in Scott U<sup>12</sup> et al.

Other parameters such as Central macular thickness (CMT) and macular perfusion could not

be assessed due to non availability of FFA and OCT.

### Conclusion

Diabetic macular edema is a potentially sight threatening complication of people affected by DM worldwide.

Early diagnosis by frequent screening and strict blood sugar control can prevent the visual morbidity associated with macular edema.

Laser photocoagulation is the gold standard procedure for Diabetic Macular edema. It is the benchmark of comparison for all the other newer treatment modalities for the past 30 yrs.

In recent changing times, it still holds importance in being the most cost effective treatment procedure for sight threatening complication of Diabetic retinopathy that is CSME as evidenced by our study.

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