



Study of the Effect of Grid Laser Photocoagulation on Contrast Sensitivity in Patients with Diabetic Macular Odema

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Introduction

Contrast sensitivity is an important aspect of visual function and is even more important for ordinary daily tasks than visual acuity. Contrast sensitivity function may be deteriorated to a significant level in diabetic retinopathy, especially in diabetic macular edema.^[1-4]

Diabetic macular edema is a microvascular complication of diabetes mellitus defined as retinal thickening resulting from the accumulation of fluid in the retina. When it is associated with hard exudates, both retinal damage and permanent visual loss will occur.^[5]

Diabetic macular Odema is one of the major causes for moderate vision loss in diabetic patients. Laser photocoagulation is the treatment modality for DME either focal or grid laser is done which reduces the odema thus improving the vision and contrast sensitivity.^[6,7]

The objective of this study was to determine the impact of macular laser photocoagulation as the standard treatment of clinically significant macular edema on contrast sensitivity.

Objectives

- To assess the improvement in contrast sensitivity with Pelli Robson chart after grid laser

- To quantify assessment of macular thickness by OCT.
- To assess the improvement in visual acuity with ETDRS chart after grid laser.

Materials and Methods

This study was carried out among 50 patients in the department of Ophthalmology, Chalmeda Institute of Medical Sciences from June 2010 to June 2011. All the patients who were presenting with Diabetic CSME were screened and selected for the study.

Inclusion Criteria

- Patients with Non Proliferative Diabetic Retinopathy with Clinically significant macular odema (CSME)
- Visual acuity 6/24 or better

Exclusion Criteria

- Psuedophakia
- Age related macular degeneration
- Glaucoma
- Proliferative diabetic retinopathy
- Post pan retinal photocoagulation
- Ischemic maculopathy

Procedure

- Detailed history was taken from all the patients regarding the duration and treatment for Diabetes.
- Contrast sensitivity is recorded with Pelli-Robson chart.
- Visual acuity recorded with ETDRS chart.
- Intra Ocular Pressure is measured by applanation tonometry.
- Anterior segment examination with slit lamp biomicroscopy was done.
- Posterior segment examination with 90 D, binocular Indirect ophthalmoscope and a detailed fundus drawings were done and fundus photo was taken for documentation.
- Fundus fluorescein angiography (FFA) and Optical coherence topography (OCT) were done for all patients.
- Biochemical marker HBA1C level was documented.
- These patients are treated with grid laser and followed up over 3 months.
- Grid laser done for patients with diffuse macular odema using double frequency Nd yag laser 532nm.
- The parameters of grid laser are:
 - Duration- 100- 200ms
 - Spot size- 50 – 100 u
 - Intensity-mild to moderate
 - One burn width apart,
 - 500u from centre of macula and
 - 500u from temporal margin of disc.
- Guidelines for Follow up: Patients were followed up over a period of 4 weeks, 8 weeks, 12 weeks for improvement in contrast sensitivity with pelli robson chart, visual acuity by ETDRS chart during follow up. Quantitative analysis of macula thickness was documented by OCT.

Results

Table showing the demographic characteristics of study population:

Parameter	Frequency	Percentage
Age distribution		
31 - 40	14	28
41 - 50	11	22
51 -60	17	34
61 - 70	8	16
Gender distribution		
Male	32	64
Female	18	36

Majority of the study population were between the age group of 51-60 years and were males.

Table showing the ETDRS score after 3 months

No of letters improved on ETDRS chart	ETDRS Score = no of letters read plus 30 at distance of 4m	Eyes
5 letters	Score from 40 to 45	10
	Score from 45 to 50	22
	Score from 50 to 55	22
	Score from 55 to 60	10
	Score from 60 to 65	2
10 letters	Score from 45 to 55	14
	Score from 50 to 60	6
15 letters	Score from 50 to 65	4
No improvement	Score from 45 to 45	8
	Score from 50 to 50	2

Table showing the improvement in ETDRS score after 3 months:

RESULTS	EYES
Improvement	90
5 letters	66
10 letters	20
15 letters	4
No Improvement	10

There was improvement in 90 eyes in the treated eyes, where as 10 eyes did not show any improvement. With 66% showing 5 letters improvement, 20% showing 5 letters improvement, 4% showing 15 letters improvement aft 12 weeks of grid laser. By chi-square test P value was <0.0001 which was statistically significant

Figure showing the improvement in ETDRS score after 3 months:

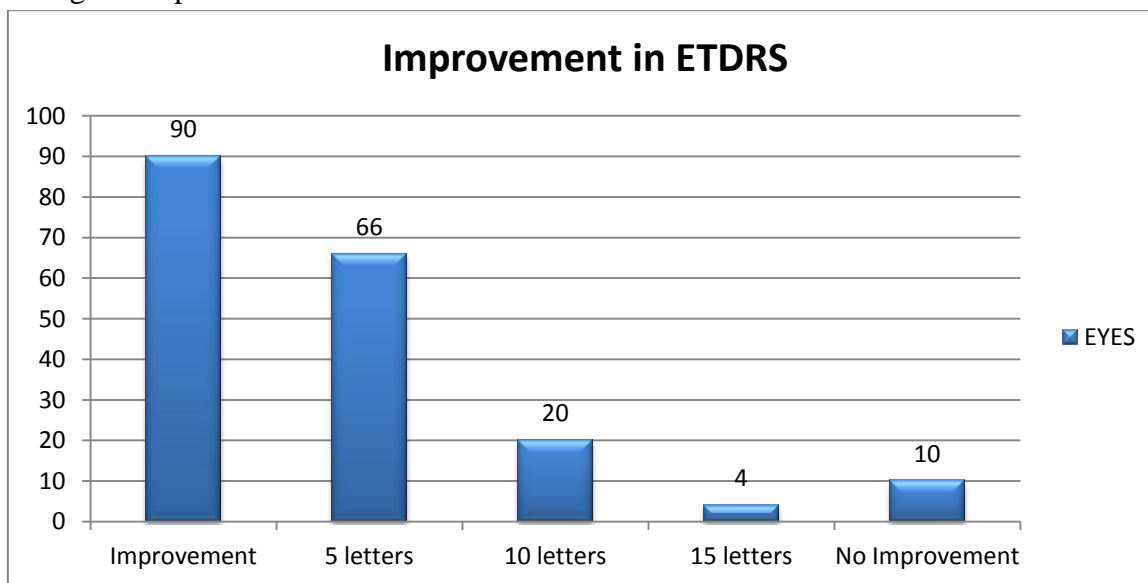


Table showing the Results of Improvement of Contrast sensitivity in Pelli Robson chart

Improvement assessed by % loss of contrast sensitivity	Eyes
From 30% loss to 20%	2
From 20% loss to 10%	22
From 10% loss to 5%	38
From 5% loss to 1%	8

Figure showing the Results of Improvement of Contrast sensitivity in Pelli Robson chart

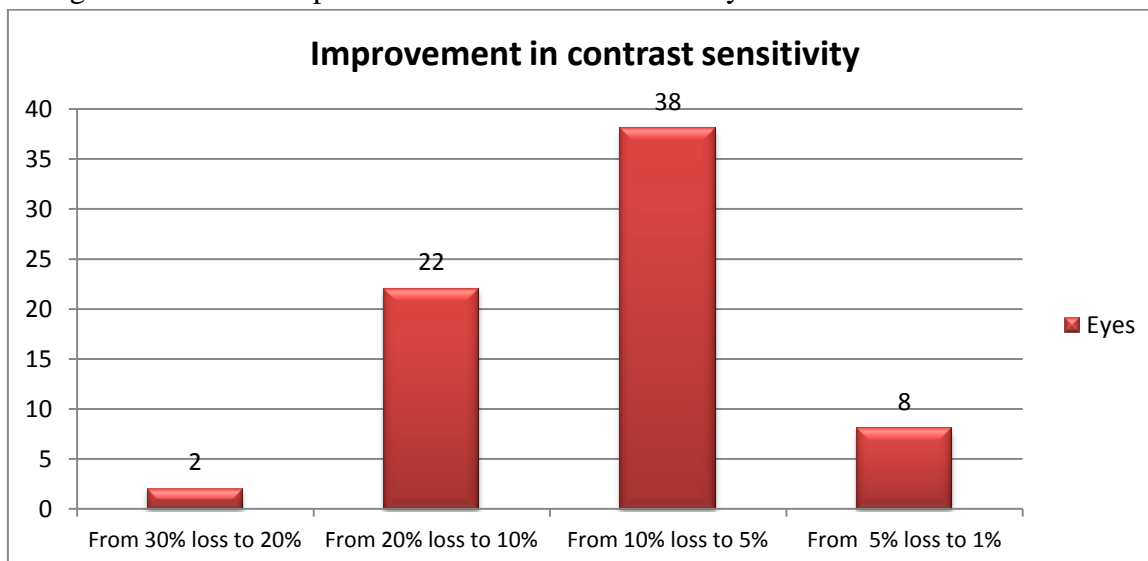
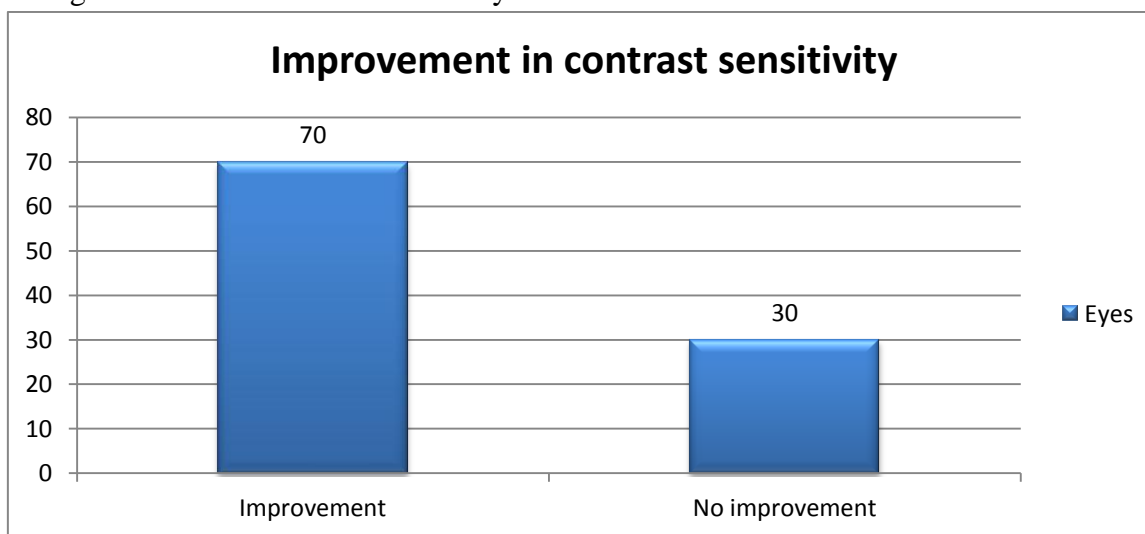


Table showing the results of contrast sensitivity:

Results	Eyes
Improvement	70
No improvement	30

Figure showing the results of contrast sensitivity:



In the present study 70% showed the improvement, 30% did not show improvement. Among the patients who improved 2 eyes had improvement with loss of contrast sensitivity from 30% to 20%. 22 eyes showed improvement

from 20% loss to 10%. 38 eyes showed improvement from 10% loss to 5%. 8 eyes showed improvement from 5% loss to 1%. By chi-square test P value was <0.0001 which was statistically significant.

Table showing the Correlation of contrast sensitivity with visual acuity:

ETDRS SCORE	% loss of Contrast sensitivity						Total
	1 %	5 %	10 %	20 %	30 %	50 %	
40	0	0	0	0	0	2	2
45	0	0	0	4	10	0	14
50	0	10	12	2	0	0	21
55	0	22	14	0	0	0	36
60	6	8	2	0	0	0	16
65	2	6	0	0	0	0	8
Total	8	46	28	6	10	2	100

2 eyes with ETDRS score of 40 had 50% loss of contrast sensitivity, 4 eyes with score of 45 had 20% loss of contrast sensitivity, 10 eyes had 50% loss of contrast sensitivity. 10 eyes with score of 50 had 5% loss of contrast sensitivity and 12 eyes had 10% loss of contrast sensitivity. 8 eyes with score of 60 had 5% loss of contrast sensitivity. The chi-square test had P value < 0.0001 which was statistically significant.

Table showing the pattern of FFA leak

FFA Pattern	EYES
Focal leak	35
Diffuse leak	48
Mixed pattern	17

Most of the patients in the study 48 eyes had diffuse pattern of leakage, 35 eyes had focal leakage, 17 eyes had mixed pattern leakage. Ischaemic maculopathy was excluded from the study as laser was not indicated for such patients.

Table showing the OCT findings:

OCT FINDINGS	EYES
Cystoid odema	28
Spongy odema	48
Subfoveal detachment	16

Most of the patients in our study included spongy type of macular odema (48 eyes), cystoid odema in 28 eyes, subfoveal detachment in 16 eyes.

Table showing the comparison of pre and post macular thickness:

Macular Thickness	Pre treatment	Post treatment
<200	0	24
200-250	29	47
251-300	45	25
301-350	16	4
351-400	10	0

P<0.00001

Discussion

This study included 100 eyes of 50 patients from June 2009 to June 2011. Most of the patient in our study were in the age group of 51- 60yrs (34%). In our study male patients were 62 % and remaining 36% being females.

Visual acuity by ETDRS chart

There was improvement in 90 eyes in the treated eyes, where as 10 eyes did not show any improvement. With 66% showing 5 letters improvement, 20% showing 5 letters improvement, 4% showing 15 letters improvement aft 12 weeks of grid laser. As per ETDRS study there was reduction in the moderate visual loss. By chi- square test P value was < 0.0001 which was statistically significant.

Contrast sensitivity by Pelli Robson chart

In our study there was improvement in contrast sensitivity in 70 eyes. And 30 eyes did not show improvement. Among patients who didnot improvement, 9 patients(18 eyes) had poor glycemic control, 3 patients (6 eyes) had hard exudate on the fovea and 3 patients (6 eyes) had chronic persistent CSME. By chi- square test P value was < 0.0001 which was statistically significant.

Correlation of contrast sensitivity with visual acuity

Contrast sensitivity can be impaired even in the presence of normal visual acuity. As per study visual acuity with 6/24 or better only were included in the study.2 eyes with ETDRS score of 40 had 50% loss of contrast sensitivity, 4 eyes with score of 45 had 20% loss of contrast sensitivity, 10 eyes had 50% loss of contrast sensitivity. 10 eyes with score of 50 had 5% loss of contrast sensitivity and 12 eyes had 10% loss of contrast sensitivity. 8 eyes with score of 60 had 5% loss of contrast sensitivity. There is no significant association between visual acuity and Contrast sensitivity.

Macular thickness in OCT

Macular thickness showed significant improvement. Prior to treatment 71 % patients had thickness more than 250 microns. Post treatment all patients had macular thickness less than 350 microns. However reduction in macular thickness didnot correspond to an equivalent increase in visual acuity and contrast sensitivity could be due to long standing macular odema which leads to photoreceptor damage

Conclusion

Contrast sensitivity is an important aspect of visual function and is even more important for ordinary daily tasks than visual acuity. Loss of Contrast sensitivity is more important and disturbing for the patient than is the loss of visual acuity

Visual acuity was recorded by ETDRS chart due to the fallacies associated in Snellen shart. The Contrast sensitivity was recorded by Pelli Robson's chart was sensitive and reproducible. Grid laser photocoagulation in CSME helps in improving the contrast sensitivity and stabilizes the visual acuity.

The changes in contrast sensitivity and visual acuity are independent of each other

Conflicts of interest: None

Source of funding: None

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