

Study on Visual Outcome, Visual Recovery Time, Recurrence, Complications in Patients of Central Serous Retinopathy Treated with and without Early Double Frequency Nd-YAG Laser Photocoagulation

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Abstract

Background: Evaluate final visual outcome, visual recovery time, leakage resolution time on Fundus Angiography (FA), recurrence rate and complications in patients of Central Serous Chorioretinopathy (CSCR) treated with early double frequency Nd-YAG laser photocoagulation as compared to observation alone.

Methods: Prospective, interventional, non-randomized, clinical, comparative trial. Two groups with 15 eyes of CSCR in each group were compared. First group treated with early double frequency Nd-YAG laser and other kept on observation. Best Corrected Visual acuity (BCVA) was recorded at baseline, 2 weeks, 1 month, 2 months and 3 months. FA was done at baseline, 2 weeks and 3 months. Contrast sensitivity was recorded at baseline and at the end of 3 months. Residual metamorphopsia checked at the end of 3 months using Amsler Grid.

Results: BCVA significantly improved in the laser group at the end of 2 weeks ($p < 0.001$). Although at the end of 3 months all 30 eyes had BCVA of 20/30 or better. At baseline all 30 eyes showed leakage on FA. At 2 weeks none of the eye in laser group showed leakage, while all 15 eyes in the observation group showed some amount of leakage. No leakage found in all 30 eyes at 3 months. Contrast sensitivity and residual metamorphopsia was similar in both groups at 3 months. There were no recurrences in the laser group during follow-up of 1 year, while in the observation group 2 eyes had recurrence. None of the eye in the laser group showed any complication related to laser on follow-up.

Conclusions: Early double frequency Nd-YAG laser photocoagulation shortens the time for visual recovery and resolution of leakage on FA in patients of CSCR; is not associated with recurrences or complications but has no effect on the final outcome of quality of vision as compared to observation alone.

Keywords: Central serous chorioretinopathy; Early double frequency Nd-YAG laser photocoagulation

Introduction

Central serous chorioretinopathy (CSCR) is a sporadic disorder of the outer blood retinal barrier, characterized by a localized detachment of the sensory retina at the macula secondary to focal RPE defects, usually affecting one eye [1]. Detachment of the pigment epithelium results from the accumulation of fluid derived from the choriocapillaries, either directly or from new vessels extending into the sub-pigment epithelial space [2]. Increasing evidence implicates an abnormal choroidal circulation as the cause of CSCR [3].

CSCR is usually a self-limiting disease typically affecting young or middle aged men usually between 20-50 years of age [4]. In terms of gender, there is a male predilection with the reported male: female ratio ranging from 6:1 in older studies and less than 3:1 in more recent literature [5].

Various risk factors associated with CSCR include Type A personality, hypertension, gastrointestinal reflux disease, organ transplantation, lupus erythematosus, Helicobacter pylori infection, endogenous hypercortisolism, and various medications such as corticosteroids, indapamide, sildenafil citrate [6,7].

Presentation is with unilateral blurred vision associated with a relative positive scotoma, micropsia and metamorphopsia. There occurs delay in retinal recovery time after exposure to bright light, loss of colour saturation and diminished contrast sensitivity. Visual acuity is decreased and often correctable with a weak plus lens. A round or oval detachment of the sensory retina is present at the macula [3].

Optical coherence tomography (OCT) shows an elevation of full

thickness sensory retinal layer from the highly refractive RPE layer separated by an optically empty zone [8,9]. Sometimes a defect in the RPE may be demonstrated [10]. Fundus Angiography (FA) shows smoke-stack or ink blot pattern. ICG early phase shows dilated choroidal vessels at the posterior pole. The mid stages show multiple areas of hyperfluorescence due to choroidal hyper-permeability suggesting a more generalized RPE or choroidal vascular disturbance [11].

Since the vast majority of cases of CSCR resolve spontaneously over time, most often the initial treatment of choice is observation [12]. But a second school of thought state has used green laser photocoagulation (Argon laser or double frequency Nd-YAG laser or diode laser) as a treatment modality. Permanent RPE change is induced at the site of laser scar. It has been suggested that while the scar facilitates the absorption of sub-retinal fluid via the choroids, it also destroys an area of abnormally hyper secreting RPE cells. It is advisable to wait for 3-4 months before considering treatment of the first attack and one to two months for recurrences. Photodynamic Therapy with verteporfin

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for CSCR is also being used [13,14]. Verteporfin accumulates in RPE cells due to their high lipid content and the drug binds to low-density lipoprotein receptors on endothelial cells. The direct action of PDT on choriocapillaris endothelium produces occlusion and reduced vascular permeability. RPE cells damaged by PDT are replaced by new ones with normal anatomical, physiologic and metabolic functions.

The aim of this study was to evaluate the time taken for visual recovery, the final visual outcome, recurrence rate and possible complications in patients of CSCR treated with early double frequency Nd-YAG laser photocoagulation as compared to those patients of CSCR treated with observation alone.

Methods

It was a prospective, interventional, non-randomized, clinical, comparative trial conducted from May 2010 to June 2011. The subjects of this study were 30 eyes of CSCR. All patients who agreed to participate in the study were given a choice of early double frequency Nd-YAG laser photocoagulation and observation after explaining the costs, benefits and risks of each treatment. True randomization was not possible in this trial due to substantial differences in the cost of the two treatments. The laser group comprised of 15 eyes which underwent early laser photocoagulation and the observation group comprised 15 eyes which underwent observation.

The principal inclusion criteria for patients participating in the trial were patients with CSCR, eyes with clear ocular media, eyes with leakage outside the Foveal Avascular Zone (FAZ) (i.e. leakage located 500 μ m away from the central fovea as detected by fundus angiography) and eyes with leakage at single focus. The exclusion criteria were eyes with opaque ocular media, eyes with leakage within the Foveal Avascular Zone (FAZ) (i.e. within 500 μ m from the central fovea) and patients with multiple leakages, evidence of ischemic maculopathy on FA, patients with other retinal diseases like diabetic retinopathy, hypertensive retinopathy, cystoid macular edema, Choroidal Neovascular Membrane (CNVM) formation owing to Age Related Macular Degeneration (ARMD), patients with visual impairment owing to any other ocular or systemic disease, patients with known hypersensitivity and allergy to fluorescein dye.

The study was performed in accordance with the Declaration of Helsinki protocol.

Fundus evaluation was done by direct ophthalmoscopy, indirect ophthalmoscopy, slit-lamp biomicroscopy using 90D lens and colour fundus photography in all 30 eyes.

In the laser group, BCVA by Snellen's chart was recorded at baseline. Then double frequency Nd-YAG laser (532 nm) photocoagulation was applied to the focal RPE leak to produce a light scar over it. Typically 6-12 laser burns of 50-200 μ m spot size at 0.1 second duration and 75-200 mW were used. BCVA was again recorded post laser at 2 weeks, 1 month, 2 months and 3 months. Similarly in the observation group, BCVA was recorded at baseline, 2 weeks, 1 month, 2 months and 3 months.

In both the groups, FA was done at baseline, at 2 weeks and at 3 months to see for any remaining leakage. Amsler Grid was used to document metamorphopsia at presentation and check for any residual metamorphopsia at the end of 3 months. Contrast sensitivity was measured in both the groups by Pelli- Robson Log contrast sensitivity chart at baseline and at the end of 3 months.

Patients in both the groups were followed up for a period of 1 year to check for any recurrences. In the laser group, the patients

were observed for development of any complications related to laser photocoagulation such as choroidal neovascularisation, central scotoma, foveal distortion or sub-retinal fibrosis.

Statistical analysis

Visual acuity readings in both the groups were converted into their corresponding LogMar values for application of statistical tests of significance.

In the laser group BCVA before laser and at 2 weeks post laser was compared using the paired t-test. In the observation group BCVA at baseline and at 2 weeks was compared using the paired t-test. BCVA at 2 weeks in both the groups was compared using the Independent sample t-test. Finally BCVA at 3 months in both the groups was compared using the Independent sample t-test. Contrast sensitivity at 3 months compared using the Independent sample t-test. Recurrence rate in two groups compared using fisher's exact test.

Results

Sex distribution

Out of total 30 patients who participated in this study, 27 were males and only 3 were females (Table 1). The male: female ratio was 9:1.

Age distribution

Maximum patients, 60% (i.e. 18 out of 30) were in the age group of 31-35 years. Only 6.66% (i.e. 2 out of 30) were above 40 years and only 10% (i.e. 3 out of 30) were below 30 years (Table 1).

Best corrected visual acuity recordings in laser group

None of the eyes had BCVA worse than 20/40 and 11 out of 15 eyes had BCVA of 20/30 or better at 2 weeks post laser (Table 2). BCVA before laser (mean value in logmar 0.49 ± 0.23) and at 2 weeks post laser (mean value in logmar 0.21 ± 0.06) was compared which gave a p value of <0.001 which was statistically significant. All 15 eyes had BCVA 20/30 or better (mean value in logmar 0.16 ± 0.6) at 3 months post laser (Table 2).

Best corrected visual acuity recordings in observation group

In the observation group at 2 weeks most of the eyes (12 out of 15) had no improvement in their baseline visual acuity. Only 3 eyes had marginal improvement in BCVA (Table 3). BCVA at baseline (mean value in logmar 0.5 ± 0.21) and at 2 weeks (mean value in logmar 0.49 ± 0.18) was compared which gave a p value of 0.16 (i.e. $p>0.05$) which was statistically not significant. Most eyes had an improvement in BCVA and 14 out of 15 eyes had a BCVA of 20/40 or better at 2 months. All 15 eyes had BCVA of 20/30 or better (mean value in logmar 0.23 ± 0.22) at 3 months (Table 3).

Contrast sensitivity score in laser group and in observation group

Patients in both the groups showed improvement in contrast

Age Group (in years)	Male (%)	Female (%)	Total (%)
≤ 30	3 (10%)	0	3 (10%)
31-35	16 (53.33%)	2 (6.66%)	18 (60%)
36-40	6 (20%)	1 (3.33%)	7 (23.33%)
>40	2 (6.66%)	0	2 (6.66%)
Total	27 (90%)	3 (10%)	30 (100%)

Table 1: Age and sex distribution.

Patient no.	Pre laser BCVA	BCVA 2 weeks post laser	BCVA 1 month post laser	BCVA 2 months post laser	BCVA 3 months post laser
1.	20/200	20/40	20/30	20/30	20/30
2.	20/80	20/30	20/30	20/30	20/30
3.	20/40	20/30	20/25	20/25	20/25
4.	20/40	20/25	20/25	20/25	20/25
5.	20/70	20/30	20/20	20/20	20/20
6.	20/40	20/30	20/25	20/25	20/25
7.	20/80	20/40	20/40	20/30	20/30
8.	20/120	20/40	20/40	20/30	20/30
9.	20/70	20/30	20/30	20/30	20/30
10.	20/80	20/30	20/30	20/30	20/30
11.	20/40	20/30	20/30	20/30	20/30
12.	20/70	20/40	20/40	20/30	20/30
13.	20/30	20/25	20/25	20/25	20/25
14.	20/40	20/30	20/30	20/30	20/30
15.	20/40	20/30	20/30	20/30	20/30

Table 2: Best corrected visual acuity recordings in laser group.

Patient no.	Baseline BCVA	BCVA at 2 weeks	BCVA at 1 month	BCVA at 2 months	BCVA at 3 months
1.	20/80	20/80	20/60	20/30	20/30
2.	20/120	20/100	20/60	20/30	20/30
3.	20/60	20/60	20/50	20/30	20/30
4.	20/40	20/40	20/40	20/30	20/25
5.	20/80	20/70	20/60	20/40	20/30
6.	20/30	20/30	20/30	20/25	20/25
7.	20/60	20/60	20/50	20/30	20/30
8.	20/60	20/60	20/60	20/50	20/30
9.	20/200	20/150	20/80	20/40	20/30
10.	20/40	20/40	20/30	20/30	20/30
11.	20/60	20/60	20/50	20/30	20/30
12.	20/80	20/80	20/60	20/40	20/30
13.	20/60	20/60	20/50	20/30	20/30
14.	20/40	20/40	20/30	20/20	20/20
15.	20/40	20/40	20/30	20/30	20/25

Table 3: Best corrected visual acuity recordings in observation group.

sensitivity at 3 months as compared to baseline values (Tables 4 and 5). Mean value in laser group was 0.8 ± 0.17 at baseline and 1.13 ± 0.11 after 3 months (Table 4). Mean value in observation group was 0.8 ± 0.14 at baseline and 1.11 ± 0.08 after 3 months (Table 5). But when both the groups were compared, contrast sensitivity after 3 months was comparable ($p=0.58$, statistically insignificant).

Resolution of leakage on fundus angiography (FA)

All 15 eyes in both groups at baseline showed leakage. At 2 weeks none of the eyes in laser group showed leakage, while all 15 eyes in the observation group still showed some amount of leakage. At 3 months no leakage was present in all eyes of both the groups on FA.

Residual metamorphopsia using Amsler Grid

All eyes presented with some amount of metamorphopsia as detected by Amsler Grid. At 3 months, 5 out of 15 eyes in the laser group (i.e. 33.33%) had some amount of residual metamorphopsia, while 6 out of 15 patients in the observation group (i.e. 40%) had some amount of residual metamorphopsia which was similar.

Complications

In the study, none of the patients in the laser group showed any complication related to laser such as choroidal neovascularization, central scotoma, foveal distortion or sub-retinal fibrosis on follow-up.

Recurrences

There were no recurrences in the laser treated group during the follow-up period of 1 year while in the observation group 2 patients (i.e. 13.33%) developed a recurrence during the follow-up period, although statistically it was insignificant ($p=0.48$).

Discussion

In the laser group BCVA significantly improved 2 weeks post laser ($p < 0.001$). This was consistent with the resolution of leakage on FA. At 2 weeks there was no leakage on FA in all 15 eyes.

In the observation group BCVA at 2 weeks did not improve significantly ($p=0.16$, i.e. $p > 0.05$). Also at 2 weeks, all 15 eyes still showed some amount of leakage on FA and thus BCVA in all eyes had almost remained the same as was recorded at baseline.

BCVA at 2 weeks in both the groups was compared which gave a p value of < 0.05 which was statistically significant. This showed that BCVA was significantly better in the laser group as compared to observation group at 2 weeks.

Finally BCVA at 3 months in both the groups was compared which gave a p value of 0.22 (i.e. $p > 0.05$) which was statistically not significant. This showed that at 3 months, improvement in visual acuity both groups was similar.

Patient no.	Pre laser	Post laser at 3 months
1.	0.45	1.05
2.	0.75	1.05
3.	0.90	1.20
4.	0.90	1.20
5.	0.90	1.20
6.	0.90	1.35
7.	0.75	1.05
8.	0.45	0.90
9.	0.75	1.20
10.	0.75	1.05
11.	0.90	1.05
12.	0.90	1.20
13.	1.05	1.20
14.	0.75	1.05
15.	0.90	1.20

Table 4: Contrast sensitivity score in laser group.

Patient no.	Baseline score	At 3 months
1.	0.75	1.05
2.	0.45	1.20
3.	0.90	1.05
4.	0.90	1.20
5.	0.75	1.05
6.	0.90	1.20
7.	0.90	1.20
8.	0.90	1.05
9.	0.60	1.05
10.	0.90	1.20
11.	0.75	1.05
12.	0.75	1.05
13.	0.90	1.05
14.	0.75	1.05
15.	0.90	1.20

Table 5: Contrast sensitivity score in observation group.

At 3 months, there was no leakage on FA in all eyes of both groups and thus BCVA in both groups had improved to comparable levels.

All 15 eyes in each groups had improvement in their contrast sensitivity scores at 3 months from baseline values and residual metamorphopsia as measured by Amsler Grid was also more or less similar in both groups at the end of 3 months.

No recurrences were seen among 15 eyes treated by laser at the end of the follow-up period of 1 year while 2 eyes in the observation group had recurrence.

Brancato et al. [15] did a long term retrospective study on two groups of patients affected with typical CSCR. One group was not treated and other was treated by direct Argon laser photocoagulation. As seen in our study, the VA of laser treated eyes improved significantly ($p < 0.05$) particularly in single focus cases ($p < 0.01$). Laser treatment did not produce any long term complications. Leaver et al. [16] did a prospective randomized trial of Argon laser photocoagulation in the management of CSCR and confirmed that this treatment hastens resolution of the serous detachment. No evidence was found to suggest that treatment influenced the final visual outcome in eyes with initial visual acuity of 6/12 or better.

From the above observations it is clear that patients who present with CSCR can either be treated with observation alone for a period of 3-4 months for the leak to resolve spontaneously or can be offered early

laser photocoagulation to aid in closure of the leak and resolution of the serous detachment and thus hasten visual recovery. But in today's busy lifestyle where waiting for a period of 3-4 months for visual recovery can lead to loss of daily wages and handicap a person, early laser photocoagulation can offer patients early visual recovery and speedier return to work.

Conclusion

Thus our study shows that early double frequency Nd-YAG laser photocoagulation hastens visual recovery by shortening the time for resolution of leakage on FA in patients of CSCR but has no effect on the final outcome of visual quality as compared to observation alone. It is not associated with recurrences. It is a relatively safe procedure if done by an experienced person is not associated with any complications.

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References

- Gass JD (1967) Pathogenesis of disciform detachment of the neuroepithelium. *Am J Ophthalmol* 63: Suppl:1-139.
- Marmor MF (1988) New hypotheses on the pathogenesis and treatment of serous retinal detachment. *Graefes Arch Clin Exp Ophthalmol* 226: 548-552.
- Prünke C, Flammer J (1996) Choroidal capillary and venous congestion in central serous chorioretinopathy. *Am J Ophthalmol* 121: 26-34.
- Bennett G (1955) Central serous retinopathy. *Br J Ophthalmol* 39: 605-618.
- Spaide RF, Campeas L, Haas A, Yannuzzi LA, Fisher YL, et al. (1996) Central serous chorioretinopathy in younger and older adults. *Ophthalmology* 103: 2070-2079.
- Tittl MK, Spaide RF, Wong D, Pilotto E, Yannuzzi LA, et al. (1999) Systemic findings associated with central serous chorioretinopathy. *Am J Ophthalmol* 128: 63-68.
- Haimovici R, Koh S, Gagnon DR, Leherfeld T, Wellik S, et al. (2004) Risk factors for central serous chorioretinopathy: a case-control study. *Ophthalmology* 111: 244-249.
- Manjunath V, Fujimoto JG, Duker JS (2010) Cirrus HD-OCT high definition imaging is another tool available for visualization of the choroid and provides agreement with the finding that the choroidal thickness is increased in central serous chorioretinopathy in comparison to normal eyes. *Retina* 30: 1320-1321.
- Fujiwara T, Imamura Y, Margolis R, Slakter JS, Spaide RF (2009) Enhanced depth imaging optical coherence tomography of the choroid in highly myopic eyes. *Am J Ophthalmol* 148: 445-450.
- Iida T, Hagimura N, Sato T, Kishi S (2000) Evaluation of central serous chorioretinopathy with optical coherence tomography. *Am J Ophthalmol* 129: 16-20.
- Guyer DR, Yannuzzi LA, Slakter JS, Sorenson JA, Ho A, et al. (1994) Digital indocyanine green videoangiography of central serous chorioretinopathy. *Arch Ophthalmol* 112: 1057-1062.
- Klein ML, Van Buskirk EM, Friedman E, Gragoudas E, Chandra S (1974) Experience with nontreatment of central serous choroidopathy. *Arch Ophthalmol* 91: 247-250.
- Taban M, Boyer DS, Thomas EL, Taban M (2004) Chronic central serous chorioretinopathy: photodynamic therapy. *Am J Ophthalmol* 137: 1073-1080.
- Wali UK, Al-Kharousi N, Hamood H (2008) Photodynamic therapy with verteporfin for chronic central serous chorioretinopathy and idiopathic choroidal neovascularization-first report from the sultanate of oman. *Oman Med J* 23: 282-286.
- Brancato R, Scialdone A, Pece A, Coscas G, Binaghi M (1987) Eight-year follow-up of central serous chorioretinopathy with and without laser treatment. *Graefes Arch Clin Exp Ophthalmol* 225: 166-168.
- Leaver P, Williams C (1979) Argon laser photocoagulation in the treatment of central serous retinopathy. *Br J Ophthalmol* 63: 674-677.