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Research Article

Half Fluence Photodynamic Therapy PDT in Treating Chronic Central Serous Chorioretinopathy CSCR Patients

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Abstract

Purpose: To report the functional and the anatomic results of the use of untargeted large spot half-fluence PDT with verteporfin for CSCR.

Methods: A retrospective analysis of 15 eyes with CSCR was performed. All eyes received half-fluence PDT centered on the fovea with a large spot (3000 μm). Best corrected visual acuity (BCVA), central macular thickness (CMT), and macular volume were evaluated.

Results: We included 13 patients (64% males, 36% females). Mean age was 44 years-old. Mean duration of CSCR was 8 months.

After applying the treatment, BCVA improved from 0.5 to 1.00 decimal (P = 0.00019). Mean CMT changed from 365 μm to 158 μm (P = 0.00067). Macular volume changed from 8.4 mm3 to 7.4 mm3 (P = 0.00013). CMT improved in 92% of patients by the end of treatment.

At the end of the follow-up: all eyes (100%) showed resolution of the sub-retinal fluid. There was no visual loss secondary to PDT, nor any other adverse events.

Conclusions: The results aim to demonstrate a new approach for treating chronic CSCR, by using a large spot centered on the fovea. The results suggest validity of the treatment in the short-term, but long-term data needs to be collected. We believe that the advantage of administering PDT centered on the fovea with a large spot is that it more appropriately addresses the primary pathophysiologic process by reducing globally the hyper perfusion to the fovea. Limitations of the new technique might include late visual loss, however the authors believe that by administering it at half-fluence such risk might be reduced.

Keywords: *Half Fluence Photodynamic Therapy PDT; Chronic Central Serous Chorioretinopathy CSCR*

Introduction

Central serous chorioretinopathy (CSR) is a serous neurosensory retinal detachment with a leak of fluid from areas in the retinal pigment epithelium [1].

CSR was first described in 1866 by Albrecht von Graefe as 'relapsing central retinitis' [2]. The exact mechanism of the disease was not known, nor it is fully understood today [4].

Vvon Graefe proposed the idea of inflammation since he noticed that all patients having the disease were suffering from syphilis at that time as well [3]. Donald Gass in 1960s first described the disease as CSR.

The symptoms are usually blurred central vision, metamorphopsia, micropsia, and central scotoma [1]. It is more common in young males and it's usually unilateral, although areas of retinal pigment epithelial defect can be noticed in both eyes [1]. CSCR is more common with type A personality individuals [4], it's often associated with stress and it's linked to the use of steroids whether it's an oral steroid, inhalers or ointments [5].

The disease is usually unilateral and is often self-limiting [6], but it might become chronic for more than 3 months in 5% of the cases, in further 30 - 50% it can be recurrent within the first year of the disease [7]. In these long standing cases retinal pigment epithelium (RPE) and photoreceptor damage can happen with permanent visual loss [6].

Attempts has been made to treat CSCR, scientists tried to use acetazolamide, B-blockers, vitamins and non-steroidal anti-inflammatory drugs but none of these were successful [8].

Many studies in the literature attempting to treat CSCR with thermal laser, they assumed that the primary pathology is at the level of the RPE. Recent studies, however, showed that the pathology is actually at the inner choroid, Indocyanine green angiography (ICG) angiography showed that there is congestive ischaemia of the choriocapillaris and that would be best treated with PDT [6].

PDT was attempted first to treat choroidal neovascularization (CNVM) in neovascular age- related macular degeneration, pathological myopia and ocular histoplasmosis.

In 1999 the treatment of age-related macular degeneration with photodynamic therapy (TAP) study group conducted a trial to evaluate the efficacy of PDT in treating neovascular AMD. The trial showed superiority of PDT vs Placebo in treating these cases ($p < 0.01$) [5].

The standard method used was the use of intravenous infusion of 30 ml of verteporfin (6 mg/m^2) over 10 minutes. 15 minutes later a laser beam at 689nm delivered 50 j/cm^2 at an intensity of 600 mW/cm^2 over 83 seconds, spot size diameter used to be 1000 μm larger than the largest diameter of the CNVM [5].

Since then there are many settings used to treat CSR with PDT, the idea is to reduce the side effects and reduce number of CSCR recurrence [5].

In our study we managed to treat our patients with half fluence PDT 25 J/cm^2 over a large area to cover the whole area of the neurosensory detachment.

Methods

We performed a retrospective medical record review of patients treated with PDT for CSCR at Maidstone Hospital, Maidstone and Tunbridge Wells NHS Trust in the UK from August 2014 through May 2017.

All patients received half-fluence PDT to the full area of neurosensory detachment. Patients included in the study had chronic CSCR diagnosed by optical coherent tomography (OCT) and confirmed by fundus fluorescein angiography (FFA).

Diagnostic criteria for CSCR was the presence of subretinal fluid (SRF) by at least 6 months, RPE changes caused by chronic or recurrent fluid. Fluid was present at the time of treatment. Patients were excluded if they have vision threatening conditions not related to CSCR, fluorescein hypersensitivity or any contraindication for PDT.

We studied 15 eyes of 13 patients (8 men and 5 women) aged between 32 and 59 years. All patients received half fluence PDT to treat chronic or recurrent CSCR. Half-fluence PDT consisted of laser at a fluence of 25 J/cm^2 instead of the 50 J/cm^2.

Patients received verteporfin by intravenous line over 10 minutes. Five minutes after the infusion was stopped, they were treated with 83 seconds of PDT (689 nm diode) applied to the whole area of the CSR. A registered nurse performed the injections and a retina specialist

performed the laser treatment based on pretreatment fluorescein angiography showing neurosensory retinal detachment. We recorded patients' demographic information, VA data, number of treatment sessions and change in CMT as measured by OCT.

Results

Patients were followed from 3 to 26 months after treatment. The mean follow-up time was 10 months. We recorded the observational data before treatment and 3 months after PDT was initiated. Results of the change of vision is shown in figure 1.

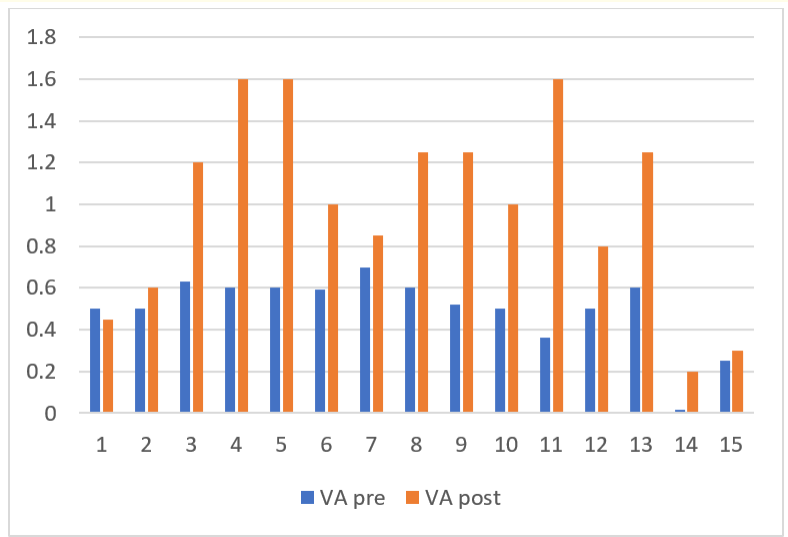

Figure 1: *Change of vision in decimal.*

The mean change of vision is shown in figure 2.

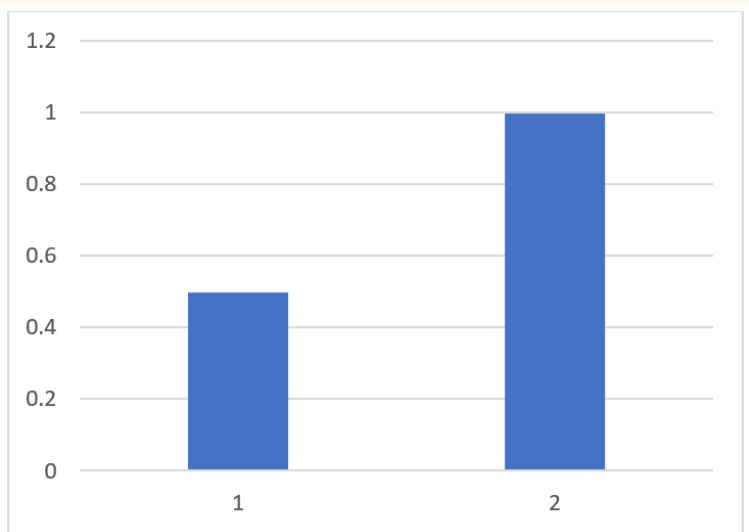

Figure 2: *Mean change of vision in decimal.*

Change in CMT is shown in figure 3.

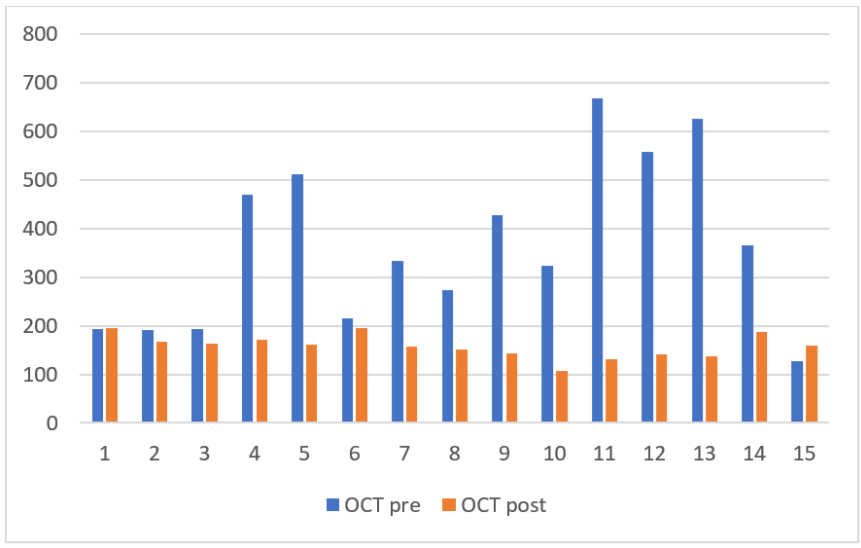

Figure 3: *Change of CMT in µm.*

Mean change in CMT is shown figure 4.

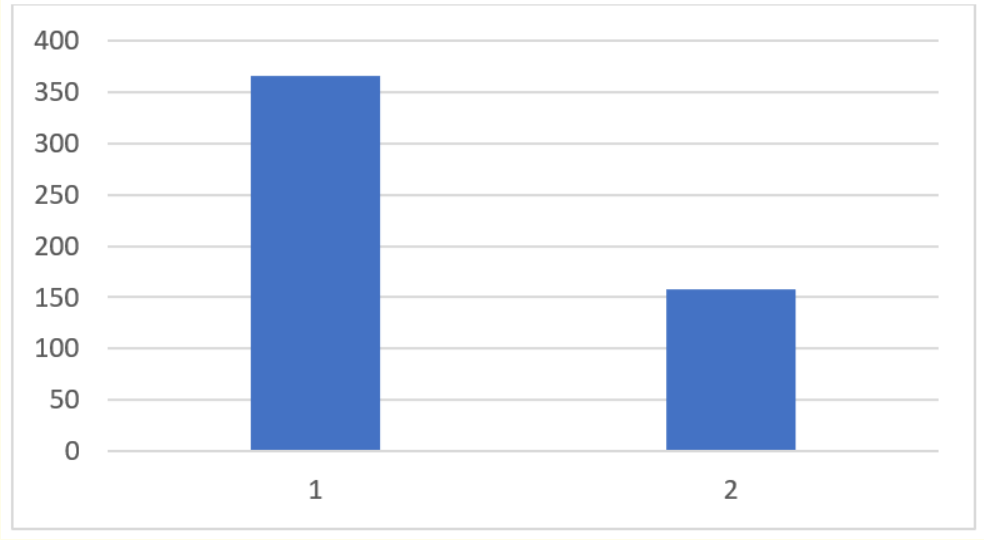

Figure 4: *Mean change in CMT µm.*

Vision was improved from 0.5 decimal to 1.00 decimal after PDT, p value = 0.000192.

CMT was reduced from 365 µm to 158 µm, p value = 0.00067. Macular volume was reduced from 8.412 mm^3 to 7.441 mm^3, p value = 0.000138.

One patient experienced choroidal neovascularization, three patients had recurrence of the CSCR after treatment, and none of the patients had any visual loss. Treatment was generally well tolerated.

Change in the macular volume with OCT shown in figure 5.

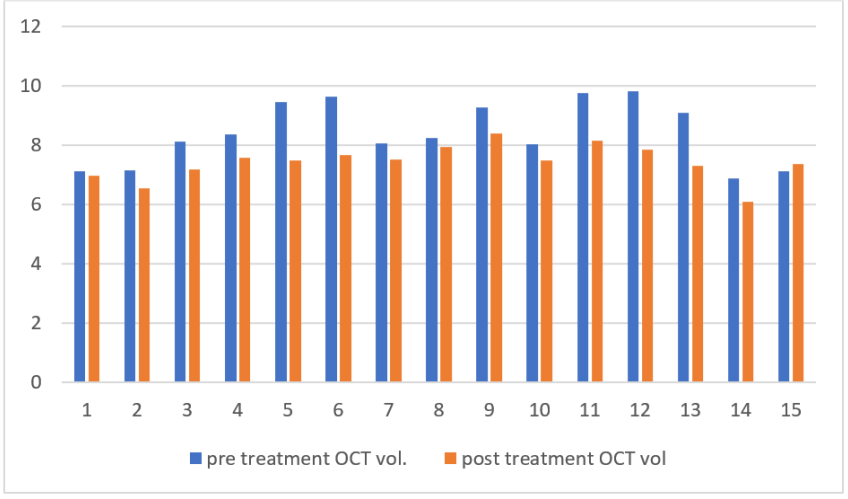

Figure 5: *Change in OCT Volume in mm.*

Change in volume of the macula in OCT, figure 6.

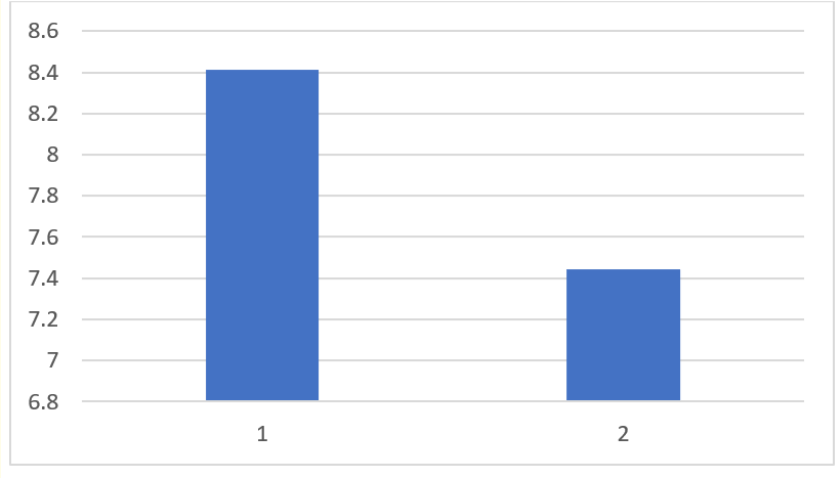

Figure 6: *Change in volume of the macula in OCT.*

Discussion

We found that half fluence, full area treatment is a successful type of therapy to CSCR with minimal side effects. Treatment was well tolerated by the patients with minimal incidence of CNVM formation and no occurrence of choroidal hypoperfusion or catastrophic visual loss. However, three patients had recurrence of the disease with one of them needed repeated treatment.

At the time being, there is no standard treatment for CSCR, although there are many attempts to treat the disease and improve the vision. Laser treatment to seal off leakage points from the choroid has been tried [1]. Although it proved to shorten the duration of the disease, it has no effect upon the final VA nor it prevent recurrence of the disease.

Smretschnig in 2012 treated a group of patients with acute central serous chorioretinopathy in Vienna, Austria with half fluence PDT. Results were excellent in improving the vision with a significant change of CMT after treatment. No recurrence of the disease was reported after 12 months of therapy and no side effect observed [9].

Their treatment is slightly different than ours in the sense that they treated patients with acute disease with less than 12 weeks duration of the disease, and they only treated the leakage areas. Whereas our patients had the disease for at least 6 months, and we treated the whole neurosensory detachment area. Likewise, both of us didn't have any major side effects.

The same group had a later study for patients who had the disease for more than 6 months, they treated them with half fluence PDT. There was persistent gain of vision even after 12 months of therapy, with full recovery of the SRF, and they had few recurrences with no side effects reported. Again, they treated the leakage areas only, while we treat our patients for the full detachment area [10].

There are several studies who reported treatment of CSCR with half fluence PDT, with Chan is the largest one. He had his study in 2008, he included 48 eyes with CSCR, he treated them with half dose verteporfin, and he followed them up to 12 months. There was stable and improvement of vision in 96% of patients with 90% resolution of SRF by 12 months [11]. This was a much larger study than us with similar results. We had 100% improvement of vision, with 93% resolution of CMT.

More recent groups studied the effect of half- fluence PDT in treating CSCR in comparison with full dose PDT. Julie in 2014 had 11 patients' eyes with CSCR treated with half fluence PDT, his patients showed improvement of vision in all of them with no serious complication [1].

Some authors compared half fluence PDT with full dose PDT. Reibaldi in 2011 evaluated half fluence PDT with standard fluence PDT and found improvement of vision in both groups with resolution of SRF. However, they noted high percentage of the full dose PDT group would have hypoperfusion of the macula (44%) compared to 0% in the half fluence group [12]. Silva followed up patients with CSCR treated with conventional PDT for 4 years, he had 46 eyes and he reported improvement of vision with resolution of SRF with no side effects, only 8.6% of his patients required more than one treatment session [13].

We did not have enough patients in our group to compare our results with other studies.

Conclusion

Our study is limited by the number of patients and the absence of a control group to compare the results, it has a retrospective nature of records. We measured the CMT with OCT and we measured the macular volume to consider the change in SRF in areas outside the central macula. Our patients experienced improvement of their vision with improvement of CMT, 20% had recurrence of the disease with only 6.7% had more than one session of treatment. One out of the 15 eyes developed CNVM.

Our study shows a new method of treating CSCR, it would help future studies in finding effective ways of treating CSCR.

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