Effective Use of 2RT® Nanosecond Laser for the Treatment of Chronic Central Serous Chorioretinopathy

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ABSTRACT

Central serous chorioretinopathy is an idiopathic accumulation of subretinal fluid which can show spontaneous resolution or can be recurrent and chronic. Patients commonly experience symptoms of decreased vision, metamorphopsia, micropsia and reduced contrast sensitivity. Effective treatment options are limited. We report the case of a 38 year-old male with a long history of chronic central serous chorioretinopathy in his left eye. He was treated with both eplerenone and conservative treatment, without any real success. However, following treatment with 2RT® laser, a subthreshold nanosecond laser, there was complete resolution of subretinal fluid. This case demonstrates the potential of the 2RT® laser to be utilised as a treatment method for patients with chronic central serous chorioretinopathy. It also reaffirms the importance for increased research into both 2RT® and other subthreshold laser treatment options for this condition.

Keywords: 2RT® nanosecond laser, central serous chorioretinopathy, micropulse laser, subretinal fluid, subthreshold laser

INTRODUCTION

Central serous chorioretinopathy (CSCR) is an idiopathic accumulation of subretinal fluid (SRF), which can show spontaneous resolution or can be recurrent and chronic.[1] Patients with CSCR commonly experience symptoms of decreased vision, metamorphopsia, micropsia and reduced contrast sensitivity. Young and middle-aged Caucasian males are more frequently affected, and it is often associated with emotional stress and type A personality, Cushing's syndrome, collagen vascular diseases, sleep apnoea and systemic corticosteroid use.[2] The clinical course of CSCR is variable and the condition can be classified as 'chronic' if there is persistent or recurrent SRF.[3,4] Persistent SRF of long duration can cause breakdown and decompensation of the retinal pigment epithelium (RPE) which then leads to RPE atrophy and photoreceptor damage, however in most cases resolution is achieved spontaneously with good visual recovery.[3,4]

Effective treatment options for chronic CSCR are limited.[3,5] Conservative treatment involves observation for three months in the hope of self-resolution.[2] Mineralocorticoid receptor antagonists have also been reported to be effective. These drugs, which include eplerenone and spironolactone work to reduce accumulation of SRF by reducing excessive glucocorticoid production which is thought to be high in CSCR.[6] Endogenous and exogenous corticosteroids have been found to be associated with CSCR and these medications target this.[3] The use of thermal laser photocoagulation has been reported as a treatment option, as has photodynamic therapy with verteporfin, and this is well documented.[3,5,7] More recently, vascular endothelial growth factor (VEGF) inhibitors have also been used to reduce SRF in the presence of choroidal neovascularisation, however this is not always an option for all types of CSCR.[3,5,7]

The use of subthreshold laser treatment such as nanosecond and micropulse lasers have been reported as somewhat effective for the treatment of CSCR.[3,4,8-10] These subthreshold lasers target the RPE layer but do not cause collateral damage to the neurosensory retina because of high thermal energy.

The most recent subthreshold laser is the Ellex 2RT® nanosecond laser (Ellex Medical Lasers Ltd, Adelaide, Australia). The 2RT® laser emits a green Nd:YAG laser of 532nm and has a 3 nanosecond duration and 400 micron spot size.[10] It

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has been reported to trigger reabsorption of the SRF and it is postulated that it can stimulate the RPE to reabsorb the SRF more efficiently, thereby allowing rejuvenation of normal RPE cells and an improvement in the blood-retina barrier.[4] Whilst it has been used in the treatment of early age-related macular degeneration[11] it is not commonly used for CSCR, but its use for this condition has been reported.[4]

CASE REPORT

A 38 year-old male accountant first presented for ophthalmologist's opinion in April 2016 complaining of blurry vision in the left eye. He had a prior history of fluctuating chronic CSCR for 5 years prior to this presentation, which began after knee pain for which oral corticosteroids were prescribed. He had previously been treated with avastin intravitreal injections and oral eplerenone for his chronic CSCR. His general health was otherwise unremarkable, and he did not wear spectacle correction. His baseline visual acuity (VA) was RE $6/6^{-1}$ and LE $6/9^{+1}$. Intraocular pressure, anterior chambers and pupils were normal. Spectral-domain optical coherence tomography (SD-OCT) showed accumulation of SRF directly under the fovea and macula of the left eye with a small pigment epithelium detachment (Figure 1). The SRF measured 5,728 microns horizontally and 122 microns vertically. He was diagnosed with CSCR.

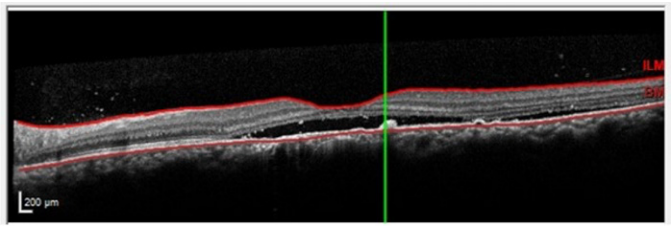

Figure 1. SD-OCT LE at baseline showing subretinal fluid under the macula, measuring 5,726µm horizontally and 122µm vertically.

The patient presented for regular follow-up and for the 3-year period following diagnosis he continued to have recurring CSCR with the presence of SRF. He reported that the recurrence tended to coincide with busy and stressful periods at his place of work, specifically during August each year and was evidenced by his presentation for ophthalmic review at this time of year, over the 3-year period. Conservative treatment was offered at this time with advice to reduce stress in addition to 25mg or 50mg of oral eplerenone. There were only two occasions of complete SRF resolution within the first 3 years following baseline.

At 3 years from baseline (March 2019), he returned complaining of blurred vision in his left eye with VA of 6/9 with +0.25 DS. SD-OCT showed SR fluid in the left eye, which was slightly smaller in area compared with baseline SRF, measuring 3,205 microns horizontally and 127 microns vertically. At this review, he was treated with 2RT® laser using the method described by Kaymak,[4] whereby the aim is to target the RPE with ultrashort pulses in a grid pattern. The laser spots are applied to the retina so that they just touch each other within the area of SRF, commonly termed 'kissing spots'. An alternate application method, if the central macula is involved, is to target the area surrounding the serous detachment with subthreshold laser. Conventionally, one or two 'test' laser applications are applied to the peripheral retina to determine the minimum threshold required to cause a thermal reaction. This then determines the laser energy required for the procedure. Kaymak[4] reported that eyes with mild RPE changes had full recovery, however those with moderate or major RPE changes were less likely to fully resolve. Specifically, at this visit the patient was treated with 0.10 to 0.12 millijoules of energy applied to and around the SRF after two test shots. One week post treatment, the SRF had almost completely resolved.

He returned a year later complaining of sudden blurry vision in the right eye 3 days prior, which had somewhat improved. A recurrence of left eye CSCR was identified on SD-OCT and he was again treated with 2RT® laser. Twenty pulses of 0.10 millijoules of energy was applied in and around the SRF, also following two test shots. Three months post treatment, he showed complete SRF resolution.

Eighteen months after the second application of 2RT® laser (5.5 years post baseline), SD-OCT showed that the SRF was fully resolved despite the best-corrected VA being 6/9 LE and a pigment epithelium detachment still present (Figure 2). Fundus autofluorescence and infrared images (Figure 3) showed hyper-fluorescent areas of imminent RPE loss and existing RPE loss where hypo-fluorescence was present.

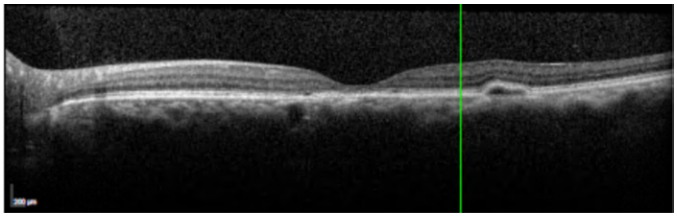

Figure 2. SD-OCT LE after treatment with 2RT® laser, showing resolution of sub retinal fluid at 5.5 years post baseline.

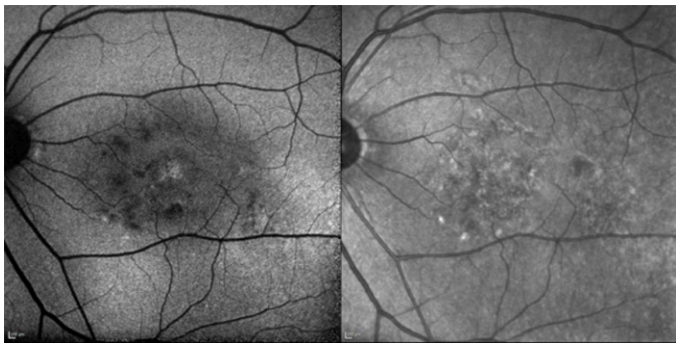

Figure 3. Fundus autofluorescence and infrared images LE at 5.5 years post baseline.

In the 3 years prior to treatment with 2RT® laser, there was frequent fluctuation of the presence of SRF with only two instances when the patient presented for review and investigation did not show SRF. After two applications of 2RT® laser, he had complete resolution of SRF and by December 2021 (21 months post second laser treatment) he has not returned with symptoms.

DISCUSSION

The literature investigating the efficacy of nanosecond and micropulse subthreshold lasers for CSCR suggests that patients with chronic SRF due to CSCR do not respond as well, particularly if the duration of SRF is longer than 12 months.[10,12] Whilst SRF usually resolves after treatment, the need for repeat laser application is common and resolution can be achieved.[9,10] This is consistent with this case report with long-standing CSCR, who did not have complete resolution of SRF after initial treatment and required additional laser application.

Whilst 2RT® laser has been shown to be effective for early age-related macular degeneration,[11] there is limited literature on its use for chronic CSCR patients. A small study by Khatri et al[12] suggests that subthreshold micropulse green laser treatment can be effective, however patients with a longer duration of SRF are less likely to resolve after treatment and repeat treatments are needed to eliminate the presence of SRF.[9,10]

This case study highlights the potential successful use of 2RT® laser to treat patients with chronic CSCR. Only one study to date has reported the efficacy of 2RT® laser for treatment of CSCR.[4] The authors reported that patients with larger RPE defects were less likely to achieve reabsorption of SRF, as was shown in our case who had significant RPE defects. Repeat treatments improved the outcome and the resolution of SRF was maintained, even when exposed to triggers such as more stressful periods at his workplace.

CONCLUSION

The use of 2RT® laser has been successful in the case presented, however given the paucity of evidence as to its effectiveness, further research is needed to demonstrate the longevity of subretinal fluid resolution, the impact of different grades of retinal pigment epithelium defect on treatment outcomes and optimum treatment protocols.

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