SUBTHRESHOLD LASER THERAPY FOR CSCR

Two cases demonstrate the effectiveness of this treatment approach.

BY RAMI MADANI, BS; ADAM AYOUB, BS; AND TAREK ALASIL, MD

Central serous chorioretinopathy (CSCR) is characterized by decompensation of the retinal pigment epithelium (RPE) and alterations of the choroidal vasculature, leading to the accumulation of fluid under the macula and, ultimately, serous detachment of the macula.[1] The exact mechanism of CSCR involves increased hydrostatic pressure in the choroid and reduced efficacy of the RPE pump.

Increased endogenous cortisol production caused by factors such as psychological stress, depression, and pregnancy have been shown to predispose individuals to CSCR.[2] Additionally, type A personality traits and exogenous corticosteroid use have demonstrated strong associations with the pathogenesis of CSCR due to catecholamine-induced alterations in choroidal blood flow and permeability.[3] Recent research has also identified genetic predispositions and systemic risk factors of CSCR.[4]

While some cases of CSCR resolve spontaneously with patients regaining normal vision, others are nonresolving and require treatment. Such chronic cases, if left untreated, can lead to severe visual decline and even permanent loss of vision.[4] Because of the condition's variable prognosis and complex etiology, CSCR management presents a significant challenge. Current treatment options include laser photocoagulation, photodynamic therapy (PDT), anti-VEGF therapy, and eplerenone; however, concerns have been raised regarding cost, safety, and availability of these therapeutic modalities.[5] Subthreshold laser therapy, which uses micropulses to stimulate the RPE without visible retinal damage, offers a potentially safer alternative with quick visual recovery.[6] Here, we present two cases of CSCR treated with 577 nm subthreshold laser therapy and discuss how this approach compares with traditional treatment options.

CASE PRESENTATIONS

Patient No. 1

A 43-year-old woman presented with a diagnosis of CSCR in her right eye and a VA of 20/60 OD. Fluorescein angiography (FA) revealed an expansile dot consistent with CSCR, indicating leakage in the macular area (Figure 1). Given the localization of the leakage and the patient's visual acuity, the decision was made to proceed with subthreshold laser therapy using a 577 nm wavelength. The patient exhibited significant improvement in VA to 20/30+2 OD 1 month after subthreshold laser therapy. She experienced no adverse events, and the fundus autofluorescence performed post-treatment demonstrated no signs of damage (Figure 2).

Patient No. 2

A 55-year-old man sought evaluation for blurry vision in his left eye and presented with a VA of 20/50 OS. FA and ICG angiography demonstrated an expansile dot along the superior arcade with inferior guttering toward the central macula, indicative of CSCR (Figure 3). The decision was made to employ both focal laser therapy at the superior leaking spot, due to its off-center location, and a single session of subthreshold laser therapy within the macula. One month after treatment, a slight improvement in his VA to 20/50+2 OS was noted. This early indication of a positive response to treatment suggested the focal laser successfully targeted the leakage point, while the subthreshold laser stimulated the processes of stabilizing the RPE and reducing subretinal fluid.

After 2 months, the patient's VA showed a more pronounced improvement to 20/30 OS with ongoing resolution of subretinal fluid and restoration of the macular architecture; after 6 months, the patient's VA improved to 20/25-1 OS (Figure 4). This improvement suggests subthreshold laser therapy not only addressed the immediate leakage causing the CSCR, but also promoted long-term retinal health and stability without causing additional damage.

COMPARISON WITH TRADITIONAL APPROACHES

Conventional laser photocoagulation, while a proven therapy in the management of CSCR cases exhibiting clear extrafoveal leakage, works by accelerating the resolution of subretinal fluid and sealing the leakage points; however, this process inflicts irreversible tissue damage and is associated

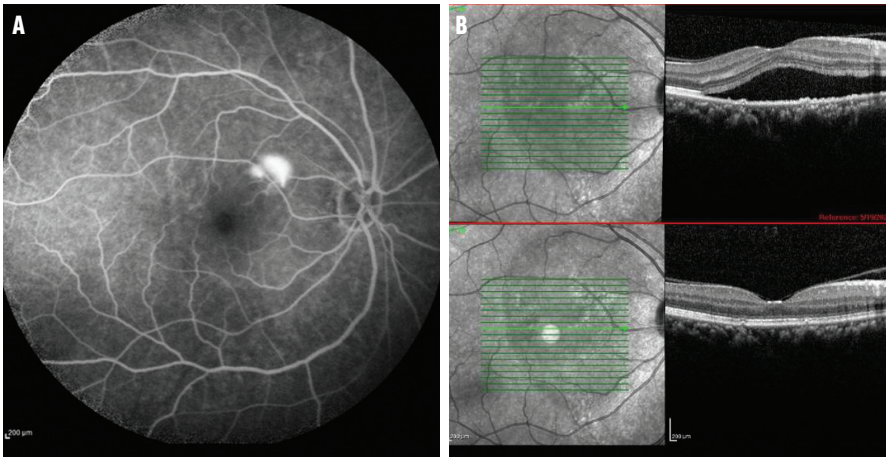

Figure 1. FA of the first patient's right eye demonstrated an expansile dot consistent with CSCR (A). Comparative spectral domain OCT imaging revealed a serous retinal detachment in her right eye (B).

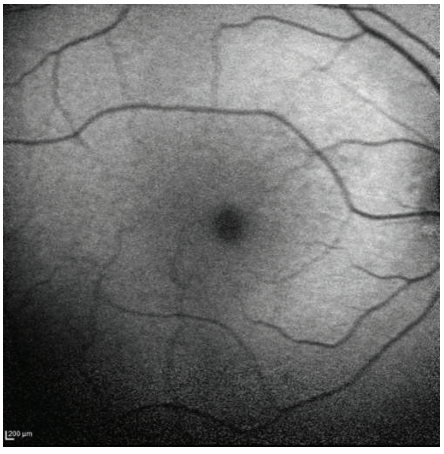

Figure. 2 One month post-subthreshold laser treatment, the fundus autofluorescence showed resolution of her retinal detachment and revealed no retinal damage.

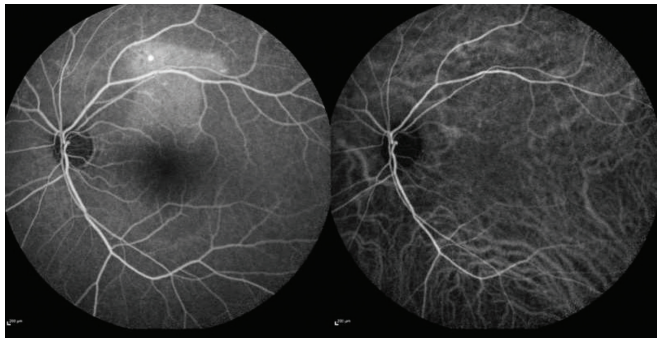

Figure 3. FA (left) and ICG angiography (right) performed for the second patient demonstrated an expansile dot along the superior arcade with inferior guttering toward the central macula, consistent with CSCR.

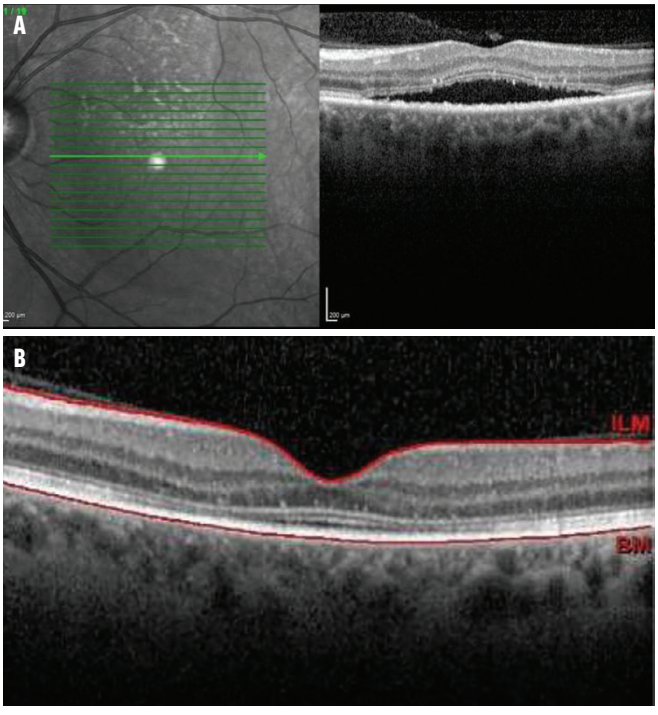

Figure 4. Spectral domain OCT images of this patient showed evident subretinal fluid in his left eye (A). Six months post-treatment, there was a remarkable improvement in retinal architecture and resolution of fluid (B).

with complications such as scotoma, choroidal neovascularization, and enlargement of the burn-treated area over time.[7] Use of 577 nm subthreshold laser therapy would avoid these potential adverse events.

PDT is another established treatment modality, specifically in CSCR cases with subfoveal or juxtafoveal leakage, multiple leaks, or chronic, diffuse RPE decompensation. PDT facilitates choroidal vascular remodeling and induces choroidal hypoperfusion. This approach involves initial intravenous administration of verteporfin, which accumulates in the ocular tissue and is activated by laser irradiation at the leakage points, thereby sealing the RPE defects and potentially mitigating the risk of recurrence in certain cases.[8] While the efficacy and reliable safety profile of PDT cannot be overstated, the unavailability of PDT in most outpatient retina clinics, especially in underserved areas, limits its practicality as a therapeutic option.

Eplerenone, a selective aldosterone-receptor antagonist and potassium-sparing diuretic, has also emerged as an alternative therapeutic strategy for CSCR. It is administered orally and, therefore, offers a noninvasive treatment pathway. However, current literature highlights limitations in its effectiveness mainly to certain chronic cases of CSCS.[9]

Subthreshold yellow laser therapy distinguishes itself by its mechanism of gently heating the RPE without surpassing the threshold for protein denaturation. Its mechanism of action employs a train of short, repetitive pulses ranging from 0.1 to 0.5 seconds, with a brief period between successive micropulses. The time between pulses allows for heat dissipation, limiting the side effects of traditional photocoagulation and targeting the RPE specifically. Practical

observations have shown that when a short pulse duration is applied to the retina, only the RPE is affected, with no harm to the inner retinal layers.[10] Thus, this innovative approach minimizes collateral tissue damage, a notable disadvantage of laser photocoagulation, by preventing the transfer of excessive thermal energy to the neurosensory retina and avoiding visible burns. Subthreshold yellow laser also is thought to enhance RPE function through the induction of heat shock proteins.[11]

A WORTHWHILE ADDITION TO YOUR ARMAMENTARIUM

The 577 nm subthreshold laser therapy is a viable option for treating cases of CSCR recalcitrant to standard laser photocoagulation therapy. It can also be done in most outpatient retina clinics, which typically lack the resources and equipment to perform PDT. Large-scale studies should focus on expanding the use of the 577 nm subthreshold laser in the management of CSCR; specifically, there is a need for clinical trials to directly compare its safety and efficacy with that of laser photocoagulation to firmly establish its position within the spectrum of available treatments for CSCR.[12] ■

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