

Navigated yellow subthreshold micropulse laser for refractory cystoid macular edema following rhegmatogenous retinal detachment surgery

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ABSTRACT

Purpose: To report the efficacy and safety of navigated 577nm yellow subthreshold micropulse laser (YSML) treatment in a case of refractory cystoid macular edema (CME) following combined phaco-vitrectomy for rhegmatogenous retinal detachment (RRD).

Observations: A 69-year-old male patient complained a slow and progressive visual loss in the right eye (RE) since two months. A complete ophthalmological evaluation was performed. Best corrected visual acuity (BCVA) was hand motion and slit lamp examination revealed a nuclear cataract and a total macula-off RRD in the RE. Patient underwent a combined phaco +25 gauge pars plana vitrectomy (PPV) with 5000 cSt silicon oil (SO) tamponade. At the 3-month follow up BCVA was 20/250, retina was completely flat but a macular proliferative vitreoretinopathy (PVR) was detected with swept source optical coherence tomography (SS-OCT) and a second 23 G PPV with PVR peeling and SO removal was performed. At 1 month visit from the second surgery retina was flat and BCVA was 20/200 due to a persistent CME. Oral carbonic anhydrase inhibitors and topical steroids were administered for 2 months without any improvements. At this point, YSML was applied with a macular grid pattern and at three months follow up visit SS-OCT showed a complete resolution of CME, BCVA was 20/100 and these anatomical and functional outcomes were maintained at 6 months follow-up.

Conclusions and importance: YSML treatment may be considered a safe and effective treatment strategy for the management of refractory CME following complex RRD surgery cases.

1. Introduction

Cystoid macular edema (CME) is a well-known complication of the anterior segment surgery, commonly referred to as Irvine-Gass Syndrome.¹

It is also observed in posterior segment intraocular surgery procedures, and it is considered a visual-threatening complication of pars plana vitrectomy (PPV).²

Specifically, the incidence of CME after surgical ab-interno management of rhegmatogenous retinal detachments (RRD) ranges from 16 % to 25 % of cases.^{3,4}

The development of CME following PPV seems to have a multifactorial etiology. This is likely to be caused by the release of intraocular inflammatory molecules and the direct damages to the retinal tissue related to the surgical procedure.² The CME can persist over time and damage the normal retinal architecture, leading to poorer functional

surgical outcomes.^{3,4}

It has been shown that the use of non-steroidal anti-inflammatory drugs (NSAIDs) can have a limited impact in preventing and treating the post-PPV edema.⁵

Yellow subthreshold micropulse laser (YSML) stimulates the retinal pigment epithelium (RPE) without causing thermal damage to the retinal tissue, downregulates a series of local growth factors, and permeability factors.⁶ It has been demonstrated as safe and useful treatment option in treating CME associated to several retinal conditions including diabetic retinopathy (DR), retinal vein occlusion (RVO) and complicated pseudophakic CME.^{7,8}

On this background, we hereby report a case of refractory CME after combined phaco-vitrectomy for a complex case of RRD followed by a second vitreoretinal surgery for PVR, successfully managed with YSML.

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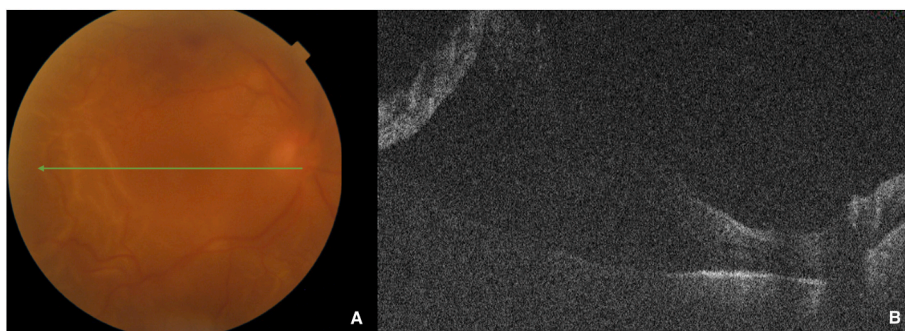


Fig. 1. Baseline color fundus picture (CFP) and swept-source optical coherence tomography (SS-OCT) of a 69-year-old male patient with rhegmatogenous retinal detachment (RRD) in the right eye.

(A) CFP shows the extension of the RRD involving the entire posterior pole and mid-periphery. The image quality is low due to the nuclear cataract and vitreous opacities.

(B) SS-OCT B scan passing through the macular region confirms the presence of the neurosensory retinal detachment in the macular area. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

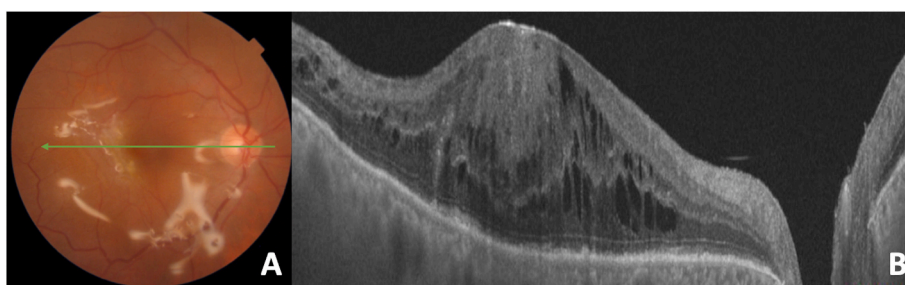


Fig. 2. Three months follow-up color fundus picture (CFP) and swept-source optical coherence tomography (SS-OCT) after the first surgery.

(A) CFP shows a flat retina with a whitish perifoveal area in the temporal side and the silicon oil filling the vitreous chamber.

(B) SS-OCT B scan passing through the fovea confirms the presence of intraretinal proliferative tissue and numerous intraretinal cysts at different retinal layers. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

2. Case presentation

A 69-year-old male patient presented at our Eye Clinic complaining a slow and progressive visual loss in the right eye (RE) since two months.

Based on the medical history the patient had no systemic diseases as risk factors for CME development.

A complete ophthalmologic evaluation was performed. Best corrected visual acuity (BCVA) was hand movement in RE and 20/32 in the left eye (LE).

Anterior segment slit-lamp examination disclosed a nuclear cataract

in both eyes, while the fundus examination revealed a total macula-off RRD with retinal tears at h X and VI in the RE, and mild RPE changes in the macular area in the left eye (LE) (Fig. 1 A). Swept-Source Optical Coherence Tomography (SS-OCT, DRI OCT Triton, Topcon) confirmed the extension of the neurosensory retinal detachment in the macular area (Fig. 1 B).

Two days later, the patient underwent a combined phaco +25 G PPV under a chandelier light assistance. After the phacoemulsification and the intraocular lens implantation, the vitreous was stained with triamcinolone acetonide and a complete core and peripheral vitrectomy was

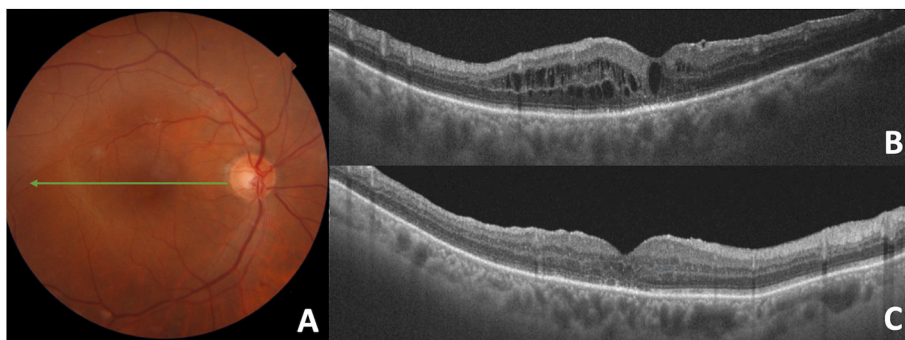


Fig. 3. Three- and six-months follow-up imaging after the silicon oil removal and proliferative vitreoretinopathy peeling.

(A) Three months after the second surgery color fundus picture shows a flat retina.

(B) Three months after the second surgery swept source optical coherence tomography (SS-OCT) B scan passing through the fovea shows the presence of cystoid macular edema at the level of inner and outer nuclear layers.

(C) Six months follow up SS-OCT after yellow subthreshold laser treatment shows a complete resolution of the CME. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

performed. Endolaser photocoagulation was performed, under perfluorocarbon liquid (PFCL), on the peripheral retinal tears, and a PFCL-air-5000 cSt silicon oil (SO) exchange was performed.

The day after the surgery, the retina was attached with the silicon oil filled the vitreous chamber.

At the 3-month follow up BCVA was 20/250, retina was completely attached but a macular proliferative vitreoretinopathy (PVR) along with intraretinal cysts were detected with SS-OCT (Fig. 2A and B) and a second 23 G PPV with SO removal, PVR peeling using brilliant blue G dye solution (0.25mg/ml) and fluid-air exchange, was performed.

At the 1 month visit from the second surgery retina was flat, intraocular pressure was 21 mmHg and BCVA was 20/200 due to a persistent CME (Fig. 3 A and B). The patient was initially treated with a topical non-steroidal anti-inflammatory drug (NSAID), Nepafenac 0.3 % twice daily. Nevertheless, the fluid still persisted after 1-month therapy.

Systemic carbonic anhydrase inhibitors (CAIs) and topical steroids eye drops were administered for additional 2 months without any improvements. At this point, the possibility of a YSML treatment was discussed with the patient. After receiving informed consent, the treatment was performed with the macular grid pattern as previously reported.⁹

In particular a total of 400 no-spacing 200 µm spots, 5 % duty cycle, power 200 mW and duration 200 ms were delivered covering the macular area with fovea sparing with navigated Navilas® Laser System 577nm.

At three months follow up visit SS-OCT showed a complete resolution of CME, BCVA was 20/100 and these anatomical and functional outcomes were maintained at 6 months follow-up (Fig. 3 C).

3. Discussion and conclusion

CME is a primary cause of reduced vision following both cataract and vitreoretinal surgery.^{3,4,10}

The etiology of CME following PPV is not completely understood. Several factors have been proposed as causative agents including post-operative inflammatory processes, complicated surgery, phototoxicity and preexisting ocular conditions compromising the integrity of the blood-retinal barrier.¹¹ The choice of tamponade in RRD repair can also significantly influence the CME formation and the use of SO can raise its incidence up to 36.2 %.¹² Furthermore, long standing or macula off RRD, PVR development and multiple surgeries are other risk factors for chronic intraretinal fluid accumulation.³

Available therapeutic interventions for postsurgical CME are based on theories regarding the pathogenesis of this condition. Nevertheless, there are no widely accepted treatment algorithms.

Anti-inflammatory therapies, such as topical corticosteroids and NSAIDs are commonly used as prophylaxis and/or treatment of CME. Among ocular NSAIDs, nepafenac is better tolerated than indomethacin and requires fewer instillations.¹³

Systemic CAIs increase fluid reabsorption from the retina by inducing acidification of the subretinal space.¹¹

Intravitreal triamcinolone acetonide and dexamethasone implant have also been proved to be effective in CME reduction, although intraocular hypertension is a potential side effect.^{11,14} In particular, vitreoretinal surgery itself is accompanied by inflammatory reactions, which may worsen or facilitate the onset of CME. The use of intravitreal dexamethasone is useful due to its long-lasting biological activity.¹⁴ Nevertheless, in Italy intravitreal injections are still performed in the operating theatre with relative costs and burden for the clinic.

In our case, we tried to manage the CME with both CAIs and topical NSAIDs for two months without any anatomical or functional improvement.

Considering that the IOP after the second surgery was 21 mmHg and the costs related to the intravitreal injection procedure in the surgical setting, we offered to the patient the possibility of a YSML treatment.

Verdina et al. reported the effects of 577-nm YSML to treat postsurgical CME in five cases occurred after uncomplicated cataract

surgery, two cases after complicated cataract surgery with posterior capsule rupture and three cases subsequent to RDD.¹⁵

YSML treatment preserve RPE from laser burns while effectively targeting the underlying disease by regulating heat-shock proteins and cytokine expression within the tissue.¹⁶

The ultrashort trains of power modulate the activation of the RPE cells and intraretinal cells, such as Muller cells.¹⁶

To date there is no standardized treatment protocol for the application of YSML in CME following PPV. We did not perform the fluorescein angiography and decided to apply the same standardized macular circular pattern proposed by Schworm et al. for patients with chronic central serous chorioretinopathy.⁹

A complete resolution of the CME was observed a 3-month follow up and was maintained at 6-month follow up accompanied by an improvement of the BCVA.

Our case description reports the effect of YSML management of postsurgical CME in a case of a combined cataract and PPV due to a macula off RRD detachment tamponated with heavy SO and successive PVR development. Besides a poor response to conventional treatments and the presence of several risk factors for CME persistence as multiple surgeries, use of silicon oil and PVR development, we achieved good morphological and functional results with one treatment session.

In conclusion, YSML may represent a valid treatment option in cases with refractory CME following combined phaco-vitreotomy for complex RRD. Compared to intravitreal dexamethasone injection, which is usually performed for postsurgical CME, YSML does not require any surgical procedure and is not related to any additional cost. Nevertheless, further prospective studies with large sample size are needed to confirm our findings.

Consent to publish this case report has been obtained from the patient writing.

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Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: The authors have no conflict of interest.

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