Case Report

Laser-Induced Choroidal Neovascularizations: Clinical Study of 3 Cases

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Keywords

Choroidal neovascularization · Laser photocoagulation · Laser-induced neovascularization

Abstract

Background: We report 3 patients with laser-induced choroidal neovascularization (CNV).

Method: Retrospective, observational case series. Medical charts and photographs were reviewed. **Results:** Two patients with central serous chorioretinopathy who developed iatrogenic CNV after focal laser photocoagulation were treated with intravitreal ranibizumab injections. One patient with CNV secondary to thermal laser photocoagulation for diabetic macular edema was treated with photodynamic therapy (PDT). Visual improvement has been demonstrated in the patients treated with intravitreal ranibizumab injections, and their successful visual outcome was stable for more than 2 years. Stable visual acuity was also observed in the patient treated with PDT, no visual improvement was observed possibly due to the macular scar and macular ischemia. No systemic or ocular complications were detected among the 3 cases. **Conclusion:** To prevent a laser-induced CNV, it is critical to avoid heavy small-spot laser burns and repeated application. Patients should be monitored carefully for CNV after laser treatment. In our cases, PDT and intravitreal ranibizumab injections were effective for the treatment of laser-induced CNV.

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Introduction

Choroidal neovascularization (CNV) following focal laser photocoagulation has been reported as possible complication in many conditions such as central serous chorioretinopathy (CSCR) [1, 2], diabetic macular edema (DME) [3], and branch retinal vein occlusion [4]. Among those, laser-induced CNV has been mostly reported in CSCR patients. Many treatment modalities have been used and have been reported to provide successful outcome. These treatments include photodynamic therapy (PDT) [5–8], intravitreal bevacizumab injections (IVB) [9, 10], and submacular membranectomy [11].

We herein describe the clinical course of 3 cases of iatrogenic CNV treated with PDT and intravitreal ranibizumab injections (IVR).

Case Report

Case 1

A 48-year-old man presented with persistent CSCR in the right eye. Pinpoint pigment epithelial leakage was treated with argon laser photocoagulation (power 150–200 mW, spot size 200 µm, exposure time 100–200 ms) (Fig. 1). His visual acuity (VA) improved to 20/20. Ten weeks after laser treatment, he noticed metamorphopsia and reduced vision. Fundus examination showed round subretinal hemorrhage nearly 1 disc diameter in size next to the laser scar. Pedunculated growth of CNV was demonstrated by optical coherence tomography (Fig. 2). The prominently classic CNV was detected by fundus fluorescein angiography (FFA) (Fig. 3). After 6 IVR, his VA has improved from 20/80 to 20/20. This successful outcome has sustained for 2 years.

Case 2

A 41-year-old woman with recurrent CSCR had diffuse retinal pigment epitheliopathy leakage demonstrated on FFA. She was treated with argon laser photocoagulation (power 200 mW, spot size 200 µm, exposure time 200 ms). Four weeks after treatment, her vision had improved to 20/20. Serous macular detachment was not detected. Two weeks later, she experienced distortion of vision. Juxtafoveal predominantly classic CNV was shown by FFA (Fig. 4). After 2 IVR, her VA improved from 20/400 to 20/30 and, thereafter, was stable throughout the 18 months' follow-up period.

Case 3

A 59-year-old man presented with submacular hemorrhage in the right eye 1 month after grid laser treatment for DME. His best corrected VA was 6/36. FFA demonstrated juxtafoveal CNV (Fig. 5). He was, therefore, treated with PDT. His VA, unfortunately, did not improve during the 6-month follow-up period possibly due to the macular scar and macular ischemia.

Discussion

In the past decades, indocyanine green angiography was not routinely used for the diagnosis of CNV and CSCR. Schatz et al. [2] reiterated that careful FFA evaluation was needed to be able to differentiate pre-existing CNV from laser-induced CNV. Matsunaga et al. [1] re-

viewed 1,824 eyes after laser photocoagulation for CSCR; iatrogenic CNV was found in only 11 eyes (0.60%). They suggested that pre-existing CNV may have been masked in CSCR patients who were older than 50 years and had weak parafoveal leaks. Secondary CNV – complicating laser treatment for DME – has also been reported. The pathogenesis, however, seems to be the same. The laser causes the break in the Bruch membrane and then initiates a proliferation of vessels from the choriocapillaries.

In our cases, laser-induced CNV, predominantly classic CNV, usually became apparent 2–5 weeks following laser photocoagulation, although it can occur years after treatment. Since there was no inciting disease to stimulate CNV progression, many cases were self-limited and VA can improve to 20/30 or better. This type of CNV acted as a bridge to gap the break in the Bruch membrane. Among many treatment modalities, PDT has been used to treat most cases with laser-induced CNV [5–8]. PDT and IVB were more effective than submacular membranectomy, after which recurrent CNV could occur [11]. Laser-induced CNV in CSCR patients had better visual outcome than in DME patients and patients with retinal vein occlusion [5–8]. For laser-induced CNV in CSCR patients, the efficacy of PDT and IVB seem to be comparable, although there are some concerns with regard to the risk of choroidal ischemia as a complication after PDT [7–10, 12].

From the literature review, no data on IVR has been published before. Herein, we found that both IVR and PDT were effective methods in treating laser-induced CNV. Recently, the results of the MINERVA study, a 12-month randomized clinical trial to evaluate the efficacy of ranibizumab in CNV associated with any cause other than not age-related macular degeneration and myopia, confirmed that ranibizumab is effective in managing CNV with a single injection, followed by a tailored PRN approach based on disease activity.

To prevent a laser-induced CNV, it is critical to avoid heavy small-spot laser burns and repeated application, especially within 0.5 disc diameter of the fovea which has greater pigmentation. The patient should be monitored carefully for CNV at the follow-up visits with repeat FFA if hemorrhage, increased turbidity of subretinal fluid, or thickening at the level of the retinal pigment epithelium, in, at, or adjacent to the area of laser application is noted.

Statement of Ethics

The authors have no ethical conflicts to disclose.

Disclosure Statement

The authors have no conflicts of interest or funding sources to disclose.

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Fig. 1. Fundus image and fundus fluorescein angiography images of case 1. Area of hypofluorescence due to subretinal fluid and small pin points of hyperfluorescence with ink blot pattern indicating central serous chorioretinopathy are presented.

Fig. 2. Optical coherence tomography images of case 1 at 4 weeks, 10 weeks after focal laser, treating central serous chorioretinopathy. Last optical coherence tomography scan showed resolved subretinal fluid after treatment with ranibizumab injections.

Fig. 3. Fundus image and fundus fluorescein angiography images of case 1. Area of abnormal hyperfluorescence in early and late phase indicating classic choroidal neovascularization is shown.

Fig. 4. Case 2. **a** Clear subretinal fluid on optical coherence tomography image with macular scar on fundus examination. **b** Six weeks after focal laser treatment, subretinal hemorrhage on fundus examination, which is concurrent with subretinal hyperreflective material on optical coherence tomography image.

Fig. 5. Fundus image and fundus fluorescein angiography images of case 3. Area of abnormal hyperfluorescence in early and late phase indicating classic choroidal neovascularization.