

Laser Beam-Related Unilateral Macular Neovascularization and Treatment Following a Laser Hair Removal Procedure

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ABSTRACT

Laser beam exposure rarely leads to a macular injury which may result in a serious sequelae. Here, we present the clinical features and treatment macular neovascularization confirmed by optical coherence angiography which developed following axillary laser hair removal procedure in a 29-years old pregnant woman (gestational age: 24 weeks). Following 2 consecutive intravitreal ranibizumab injection by 5-weeks interval, the visual acuity was improved from 1/10 at baseline to 8/10 at month 9. .

Conclusion: Unintentional laser beam exposure related macular neovascularization can be successfully treated with the intravitreal anti VEGF agent administration.

Keywords: Laser, Macular neovascularization, Ranibizumab.

INTRODUCTION

As laser beam has been used in medicine, industry and military, it is also used to eliminate hair follicles for cosmetic purposes.¹

Different lasers affect retina through photocoagulation, photodistribution or photochemical mechanisms. The severity of retinal damage is dictated by wavelength, duration of exposure, point size, power and localization.^{1,2}

Melanin absorbs visible (400-720 nm) and near-infrared (720-1400 nm) wavelength in RPE and choroid where it presents intensively, leading thermal injury in surrounding cells and tissues.³ To achieve permanent hair removal, heat should have to spread from "light" target to "biological" target, in other word to follicle body. Currently, based on photon wavelength, the red-spectrum laser (694 nm), alexandrite laser (755 nm), diode laser (700-100 nm) and neodymium-doped yttrium aluminium garnet laser are most commonly used laser systems for hair removal.^{4,5}

Laser beams can cause macular neovascularization by acting throughout retina and choroid and even by leading damage extending to internal limiting membrane and

choriocapillaris.⁶⁻⁹ The blink reflex; thus, avoiding from laser beam, limits duration of laser beam exposure to 0.15-to-0.25 seconds, acting as a protective mechanism against laser-induced injury.¹⁰ Due to effect of Bell's phenomenon, lesions are more prominently seen at posterior pole or superior macular region.¹¹ According to American National Standards Institute classification, the risk for laser-induced maculopathy is increased in \geq Class 3 laser injuries.

Since visible or near-infrared light can be intensified in retina, retina is presumably most susceptible tissue to laser-induced injury in the human body. Laser-induced retinal injuries include intravitreal, subhyaloid, intraretinal and subretinal hemorrhages, retinal edema, RPE damage, perifoveal pigment changes or deposition, ring-shape hypo-pigmented lesions in fovea and, in rare instances, macular neovascularization (MNV).²⁻⁴

Here, we discussed clinical presentation and intravitreal ranibizumab injection in a 29-years old pregnant woman presented with unilateral macular neovascularization following laser beam exposure during hair removal procedure.

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CASE REPORT

A 29-years old pregnant woman (24 weeks of gestation) was referred to our clinic by an ophthalmologist due to impaired vision. In her history, it was found out that the patient underwent axillary hair removal procedure using 755 nm alexandrite laser without protective glasses and she recognized blurred vision in left eye a few days after hair removal procedure. In ophthalmological examination, best-corrected visual acuity was found as 10/10 in the right eye and 1/10 in the left eye. Anterior segment examination and intraocular pressure (IOP) were found to be normal in both eyes. Fundus examination was normal in the right eye; however, a pigmented lesion with minimal intraretinal hemorrhage appeared to be mildly elevated was observed in the left fovea (Figure 1A). On spectral domain optical coherence tomography (OCT), it was found that there was an increase in central foveal thickness, intraretinal and subretinal fluid, disintegration at outer limiting membrane and ellipsoid zone, and hyper-reflective material (Figure 1B). In fluorescein angiography, hyper-fluorescent area was observed, which appeared at early phase and enhanced gradually (Figure 1c and D). On optical coherence tomography angiography, a glomerulus indicating neovascularization was observed in sections involving outer retina and choriocapillaris (Figure 1E and F). Based on these findings, patient was diagnosed with

left MNV following laser beam exposure. The pregnant patient was about potential adverse effects of systemic corticosteroid therapy and intravitreal anti-VGEF therapy. After informed consent of the patient, two intravitreal ranibizumab injections without systemic corticosteroid therapy were performed by 5-weeks interval. As it was failed to monitor patient closely due to pandemics, no additional therapy was given. On control visit on month 9 after diagnosis, best-corrected visual acuity was found as 8/10 in the left eye. On OCT, it was observed that fovea had almost normal anatomy (Figure 2). A subretinal elevation was observed adjacent to central fovea, which was considered as MNV sequel.

DISCUSSION

Macular neovascularization may develop due to unintentional exposure to laser beam.^{4,5, 12-23} It is thought that laser-induced MNV can occur due to release of VEGF and other angiogenic factors from ischemic RPE secondary to choriocapillaris hypo-perfusion resulting from photothermal, photochemical and underlying inflammatory events.¹² Fujinami emphasized that smaller number of MNV cases are being observed in pediatric patients and proposed that this may be related to regeneration ability of choriocapillaris or thinner Bruch's membrane which modulates inflammatory response in children.¹³

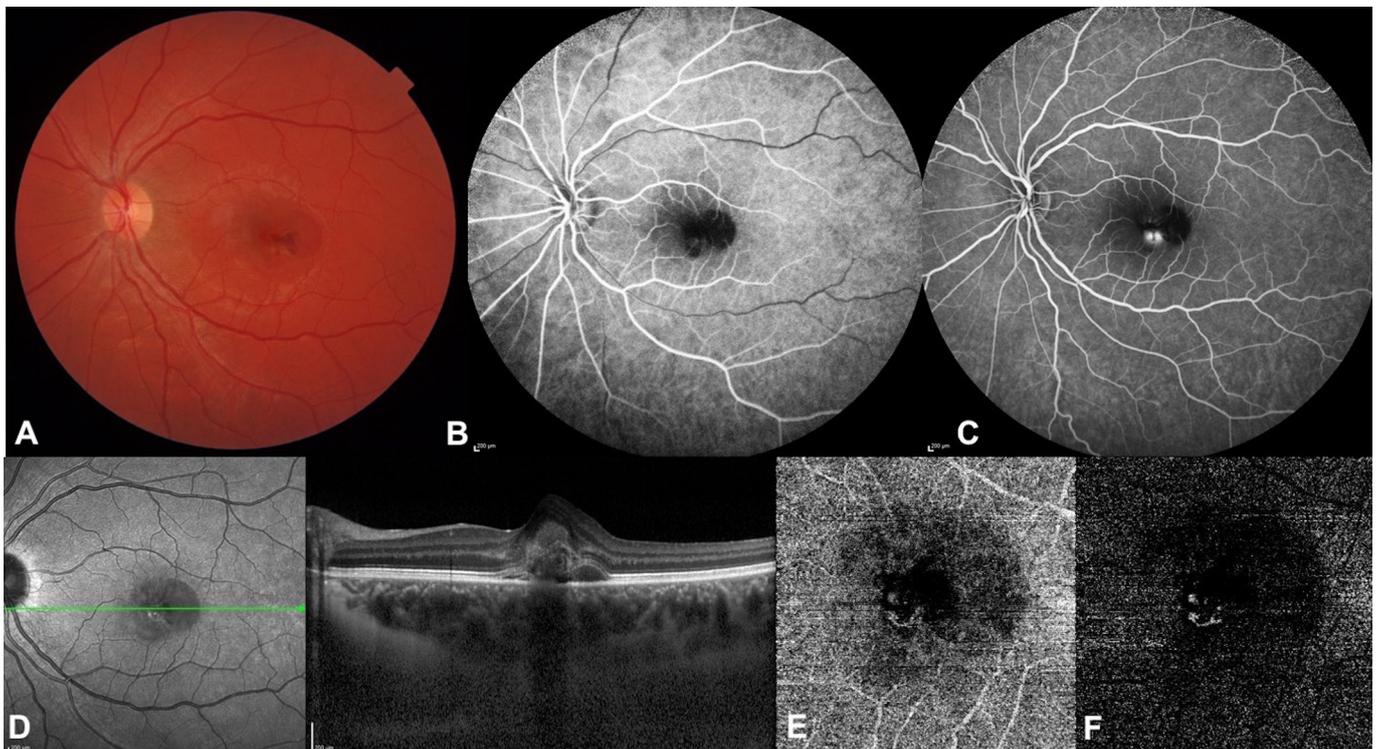


Figure 1: (A): a mildly elevated, pigmented lesion with minimal intraretinal hemorrhage in the left fovea (B-C): hyper-fluorescent area which appeared at early phase and enhanced gradually at lesion site, (D): increase in central foveal thickness, intraretinal and subretinal fluid, disintegration at outer limiting membrane and ellipsoid zone, and deposition of hyper-reflective material; neovascularization at outer retina (E) and choriocapillaris (F) on optical coherence tomography.

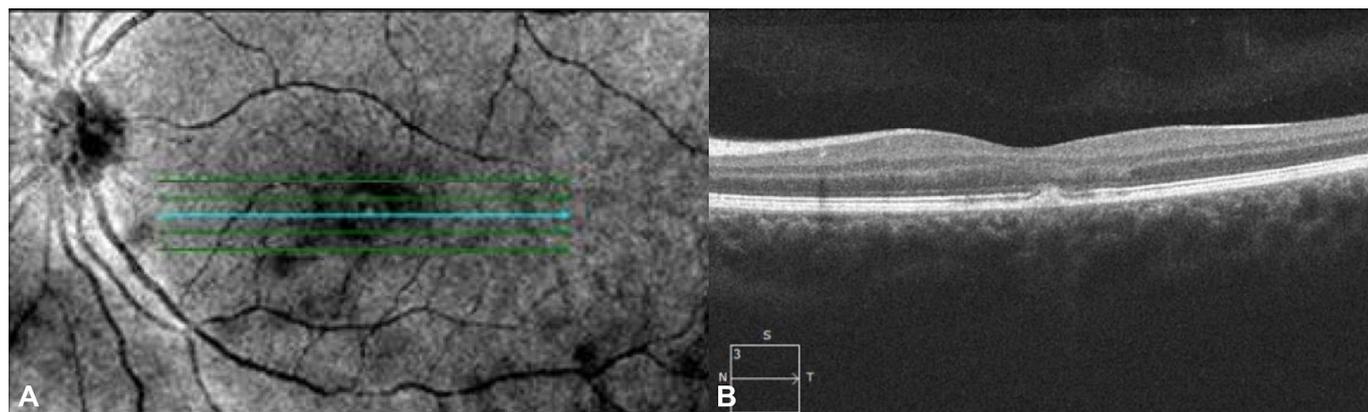


Figure 2: Normalization of fovea contour and minimal residual lesion beneath pigment epithelium on month 9 on optical coherence tomography.

Laser beam exposure may occur due to laser pointers, industrial YAG laser, argon laser, grid laser photocoagulation, laser lightening equipments and after laser hair removal procedure. Thus, protective glasses must be used. Table presents case reports about laser beam-related macular neovascularization following laser hair removal procedures in the literature.

Although there is no consensus on the treatment of laser-induced retinal injuries, corticosteroids can be used as first-line treatment as they alleviate inflammatory response due to trauma.¹⁰ The use of intravitreal dexamethasone in the primate models of high-intensity laser photocoagulation-induced subretinal neovascularization may be considered as precursor of corticosteroid therapy.²⁴ There are studies suggesting the benefit of photodynamic therapy (FDT) in the treatment of MNV secondary to laser exposure.^{25, 26}

In recent years, anti-VEGF agents are preferred in the treatment of laser-induced MNV. Due to presence of other

risk factors (age>35 years, previous history of abortion and history of diabetes mellitus), it is unclear whether anti-VEGF therapy is the only cause of fetal loss in pregnant women.²⁷ Additional care should be exercised during anti-VEGF therapy at early gestation (particularly in first trimester) until results about anti-VEGF therapy during gestation.²⁸

Although pregnancy category of ranibizumab is considered as C by FDA, no maternal or fetal adverse effect was shown in pregnant women received ranibizumab.²⁷ Thus, we preferred intravitreal ranibizumab therapy in our patient. We administered 2 intravitreal ranibizumab injection in our patient according to pro re nata regimen based on Minerva Study protocol using intravitreal ranibizumab therapy in rare cases of MNV.²⁸

In this case report, we discussed ophthalmological pathologies which may develop following laser beam exposure in patients underwent laser hair removal procedure

	Age	Gender	Eye involved	Baseline VA	Diagnosis and follow-up	Treatment	Follow-up duration	Post-treatment VA
Teodora et al.	31	Female	Right	6/15	Fundoscopy imaging, OCT and FA	Bevacizumab	6 monthss	6/6
Arslan et al.	26	Female	Left	1 mps	Fundoscopy imaging and FA	One dose of IVTA (no follow-up for 8 months), 1 dose of bevacizumab-photodynamic therapy	8 months	1 mps
Clamp et al.	30	Female	Right	EH	Fundoscopy imaging, OCT, FA and OCTA	Anti-VEGF	5 months	Hand movements (macular scar)
Wang et al.	30	Femalee	Left	20/40	Fundoscopy imaging, OCT, FA and OCTA	Oral prednisone, 5 doses of ranibizumab	51 weeks	20/50

VA, visual acuity; OCT, optical coherence tomography; FA, fluorescein angiography; mps, finger counting; IVTA, intravitreal triamcinolone acetate; HM, hand movement; OCT-A, optical coherence tomography angiography; VEGF, vascular endothelial growth factor

without protective glasses and emphasized that such pathologies can be prevented by using protective glasses. We also presented our treatment approach in unilateral MNV following laser beam exposure, emphasizing that anatomic and visual outcomes may be relatively better.

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