

Ocular Damage Secondary to Intense Pulse Light Therapy to the Face

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Purpose: To promote awareness and prevention of ocular damage that can occur during Intense Pulsed Light (IPL) treatments of the periocular areas.

Methods: A retrospective chart review was conducted of 2 cases involving ocular damage following IPL procedures that were treated at Bascom Palmer Eye Institute for ocular complications. Routine data were collected during ophthalmic examinations.

Results: Case 1: A 36-year-old female presented with eye pain, marked pupillary constriction, and anterior uveitis an hour after receiving IPL treatment to the face. Within 1 month, the damage had progressed to posterior synechiae and iris transillumination defects. She continues to have pain and severe photophobia due to permanent iris atrophy and transillumination that have persisted for years. Case 2: A 27-year-old female presented with severe eye pain, vision disturbances, pupillary defects, and anterior uveitis 3 days after IPL of an eyelid freckle. At 2 months follow up, the iris and pupillary defects remain permanent. The patient continues to suffer from photophobia and pain.

Conclusions: The pigmented iris absorbs light in the same wavelength range of IPL, thus remaining vulnerable to IPL exposure, especially when applied to the periocular area. The fact that IPL is not a laser may give people a false sense of security regarding damage to the eye. The cases presented give evidence that periocular IPL treatment may permanently affect pigmented intraocular structures. It is imperative for treating physicians to be aware of these hazards and to use appropriate eye protection to prevent ocular damage.

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Intense pulsed light (IPL) is a popular technology used in the field of cosmetic medicine for the treatment of telangiectatic lesions, skin pigmentation, and abnormal skin texture. The popularity of IPL treatments is consistently increasing as more patients favor noninvasive and nonablative treatments with successful outcomes. Patients seek treatment most often for the face but also for areas such as the hands, neck, and chest. IPL

functions in the spectrum of wavelengths from 500 to 1200 nm, targeting structures of the skin, such as pigment and hemoglobin, that absorb light within this range.¹ Standard care during IPL therapy includes ophthalmic protection for everyone in the treatment room. Transparent eye goggles with the appropriate filters should be worn by the caregiver, and nontransparent eye shields, whether adhesive or not, should be placed on the patient. On occasion the caregiver may elect to remove, reposition, or even not use eye protection when treating in the periorbital area to reach specific smaller spaces, the access to which is obstructed by the anatomy and the limited flexibility of the IPL probe. Also, protective eyewear may not be worn when treating off the face, as the distance between the treatment area and the eyes creates a false sense of security. Neglect for appropriate eye protection during IPL can easily cause ocular damage, albeit rarely reported. While commonly reported adverse events due to IPL exposure include abnormal dermatologic effects and pain,¹ a new concern for ocular safety is growing as incidents of eye injury begin to surface.^{2,3} Damage to the eye from laser treatments has been well documented,⁴ but to our knowledge, damage from IPL has not been widely discussed in the literature and has not been previously published in the ophthalmology literature. We present 2 different cases of permanent ocular damage secondary to IPL treatment, resulting in iris transillumination defects, pupil abnormalities, and anterior uveitis.

METHODS

A retrospective chart review was conducted of 2 cases involving ocular damage secondary to IPL exposure. Both patients had IPL treatment at different outlying facilities and were sent to the Bascom Palmer Eye Institute for treatment of their ocular complications. Datum collected included the age and sex of the patient, the date and area of IPL treatment, ocular history, the date of initial ocular symptoms and signs, visual acuity, intraocular pressure, pupillary light reflex, slit lamp examination with photos, and posterior segment examination. The length of follow up was also documented.

RESULTS

Case Report 1. A 36-year-old woman presented with burning, decreased vision, pupillary constriction, and severe photophobia in the right eye approximately 1 hour following IPL treatment to pigmented skin lesions in the right periocular region. A 560-nm handpiece with an unknown IPL unit was applied at 21 J/cm². Safety goggles were worn throughout the treatment, but the goggles were removed during applications on the eyelid proper to reach this small area. On examination, visual acuity was 20/20 in both eyes. The right pupil was minimally reactive and measured 3 mm in diameter. The left pupil was reactive

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and measured 5 mm in diameter. Keratic precipitates were present in the right eye. The patient was treated with tobramycin/dexamethasone ophthalmic ointment 3 times a day. Symptomatic burning, solar keratitis, and pupillary constriction resolved 9 days later, but the patient continued to have intermittent blurriness and photosensitivity to ambient light.

Fifteen days following the initial presentation, the patient sought further treatment because of continuous pain above and below the right eye. Visual acuity at this time had worsened to 20/40+ OD and remained 20/20 OS. Subepithelial infiltrates were seen in both eyes. These infiltrates were thought to have been a result of previous adenoviral conjunctivitis. Iris atrophy and transillumination defects in the superonasal area of the right eye were observed. Upon dilation with pharmacologic agents, the right pupil demonstrated abnormalities secondary to posterior synechiae. The patient also demonstrated an enlarged cup-to-disc ratio OU. At this point the patient was started on Lotemax 4 times a day.

Twenty-five days after the initial presentation, the patient came to the Bascom Palmer Eye Institute for a follow-up visit with increasing photophobia. Visual acuity and pupil assessments were unchanged. The iris abnormalities of the right eye also remained unchanged. Corneal scars were seen bilaterally, possibly due to the previous history of keratoconjunctivitis. The patient was treated with cyclopentolate to break up the synechiae. A follow-up visit 20 days later revealed no improvement.

Two months following the initial injury, the patient still reported photophobia, pain, tearing, cloudy vision, and difficulties with glare. Visual acuity had improved to 20/25 – 2 in the right eye and 20/15 – 1 in the left eye. Pupil size was unequal, with the right pupil measuring 3 mm and the left pupil measuring 4 mm. A sluggish pupillary reaction was noted in the right eye. Iris abnormalities in the right eye were unchanged. Intraocular pressure measured 14 OU. Ancillary tests were obtained at this time, including retinal nerve fiber thickness measured by Optical Coherence Tomography, which were within normal limits. Slit lamp examinations were performed, and digital photographs were taken. The photographs revealed extensive iris abnormalities in the right eye (Fig. 1) with marked anisocoria due to the posterior synechiae in the superonasal aspect. The patient was given nonprescription colored contact lenses to mitigate the photophobia.

At 2-year follow up, the patient continued to have constant pain above and below her right eye that had become debilitating and interfered with her ability to work. The patient’s photophobia and difficulty focusing continued. Her visual acuity was 20/30 in her right eye and 20/20 in the left eye at this follow-up examination. The transillumination defects and iris atrophy (Fig. 2) remained unchanged.

Case Report 2. A 27-year-old woman presented with severe eye pain, photophobia, and redness of the left eye 2 days following treatment

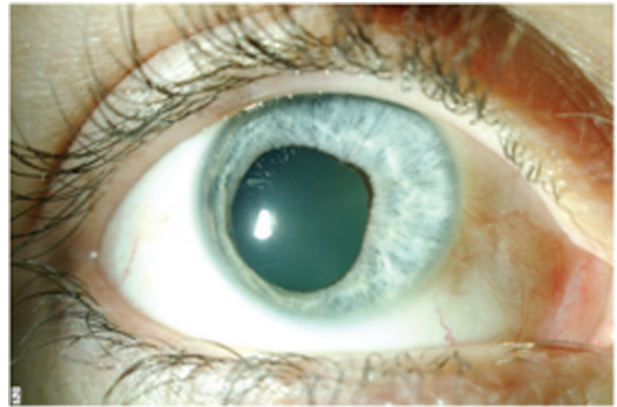


FIG. 2. Anterior view of the right eye of the right eye of patient no. 1 with pharmacologic dilation of the iris. Note the iris atrophy and pupillary distortion secondary to posterior synechiae.

with IPL to remove a freckle from her left upper eyelid. The specific settings and unit used for the IPL treatment at the outlying facility were unknown. Safety goggles were used during the IPL procedure but were removed for some applications to reach the small area of the upper eyelid. Upon initial examination, visual acuity measured 20/20 in the right eye and 20/30 in the left eye. The right pupil was round and reactive, measuring 5 mm in diameter. The left pupil was slightly oval and minimally reactive, measuring 4 mm at the longest diameter with atrophy. Intraocular pressures measured 14 mm Hg OD and 9 mm Hg OS. Mild iritis was evident in the left eye with 1+ cellular reaction and flare in the anterior chamber. The patient was treated with prednisolone acetate 1% eye drops four times a day.

Within 3 weeks, the vision improved to 20/20 in the right eye and 20/25 in the left eye. Superonasal iris atrophy was observed along with posterior synechiae, 1+ cellular reaction with flare, and pigment on the anterior lens. The patient was instructed to continue the prednisolone acetate drops, and homatropine 5% was added in an attempt to break the synechiae.

One month following the IPL treatment, the patient sought treatment at the Bascom Palmer Eye Institute for a second opinion. The patient expressed concerns about the esthetics of the iris atrophy and the asymmetry between the 2 eyes. Visual acuity measured 20/20 in both eyes at this time. IOP measured 16 OU. The left pupil was irregular and fixed when dilated pharmacologically. Iris transillumination of the superior aspect of the left eye and posterior synechiae were

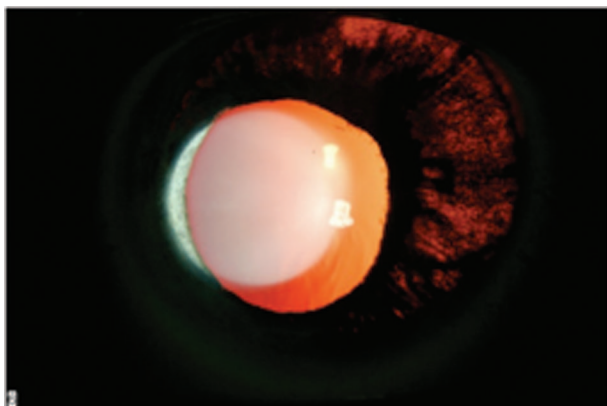


FIG. 1. Iris transillumination defects of the right eye of patient no. 1 as viewed via slit lamp biomicroscopy.

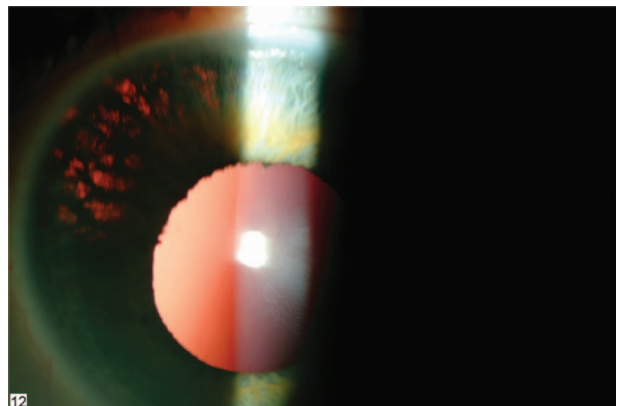


FIG. 3. Iris transillumination of the left eye of patient no. 2 as viewed via a slit lamp examination.

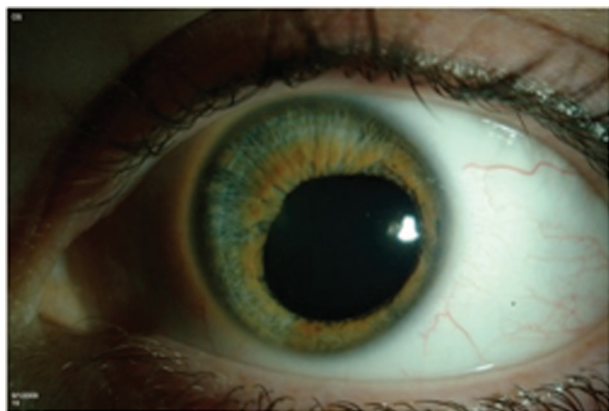


FIG. 4. Anterior view of the left eye of patient no. 2, dilated pharmacologically. Note the pupillary distortion secondary to posterior synechiae and damage to the iris dilator muscle.

also observed with a slit lamp examination (Fig. 3). The right eye was unremarkable. External photographs were taken (Fig. 4). At this point, the patient was started on a regimen of atropine and phenylephrine in further attempt to break the perceived synechiae.

At 5-month follow up, the patient continued with blurry vision, photophobia, glare, floaters, and pain in the left eye. Visual acuity measured 20/15 - 2 in the right eye and 20/20 + 2 in the left eye. Intraocular pressure measured 11 OU. Specular endothelial microscopy and corneal pachymetry measurements were obtained at this visit, both of which revealed symmetry between the eyes and remained within normal limits. A contact 35-MHz B-scan ultrasound of the anterior segment of the left eye was obtained. Results showed a peripheral iris thickness of 0.4 mm. The superonasal quadrant measured slightly thinner than the inferotemporal quadrant, which was 0.6 mm thick. No synechiae were observed. Slit lamp biomicroscopy revealed that while the anterior uveitis had resolved, superior iris transillumination defects and atrophy remained permanent within the left eye. The patient was finally given nonprescription colored contacts to decrease photophobia but still suffers from increasing glare and discomfort.

DISCUSSION

IPL consists of a flash lamp, usually xenon, that emits a bright light through a small crystal window of a plastic treatment head. Unlike lasers, which emit specific, monochromatic light, IPL puts out a light that consists of a broad spectrum of wavelengths from about 500 nm to 1200 nm.¹ Internally, water-cooled mirrors enhance reflection of the light, and a filter surrounding the flash lamp narrows the range of wavelengths emitted in each pulse. Different filters are applied to the crystal windows to allow optimal transmission of light for different functions. The 560-nm filter, like the one used in the first case, specifically targets low- and high-contrast pigmentation. Pigmented lesions of the skin absorb light within this wavelength range, which causes the breakdown of melanosomes. Many different tissues in the body have high pigment content, especially the iris, and remain highly susceptible to absorption of light within this IPL transmission range. Specifically, the iris absorbs light in the range of 400 nm to 750 nm, which includes the light emitted by the IPL. For this reason, the iris is very vulnerable to damage, especially when IPL is used in the periocular region. Since this structure is responsible for controlling the amount and quality of light that enters the eye, damage to the iris can cause increased glare, iritis, photosensitivity, and vision loss.

The 2 cases presented give evidence that periorbital treatment with IPL may permanently affect pigmented ocular structures. The short time period of 1 hour between IPL exposure and the initial presentation of patient no. 1 indicates that the IPL exposure was the direct cause of damage, targeting the iris. The second patient had a similar unilateral presentation within 2 days of treatment. In both cases, the thinning of an iris sector and pupillary abnormalities demonstrated especially with pharmacologic dilation suggest permanent structural damage due to photoablation of the iris dilator muscle. These 2 cases have nearly identical clinical presentations of iris atrophy and transillumination defects and are quite similar to other cases of patients who have undergone IPL treatment.^{2,3} In all cases, the damage has been permanent and has been extremely debilitating to each patient's quality of life. Both patients currently suffer from severe photophobia and patient no. 1 must wear plano colored contacts to withstand the sun in brightly lit areas. Both patients continue to suffer from eye pain and deformity of the pupil sufficiently severe to prevent or hinder professional responsibilities and normal activities. Patient no. 1, for example, obtained a special permit to apply dark tinting to the windows of her car because the sun exposure was too painful.

Even though the standard of care with IPL treatments includes metal eye goggles or adhesive shields applied directly to the eyelids, eye protection is occasionally removed or repositioned to treat the small areas of the eyelids. Both cases demonstrate damage to the superonasal quadrant of the iris, raising suspicion that perhaps the shields were removed while treating the hard-to-reach area of the medial canthus region. Adhesive shields place the patient at risk of ocular damage if they loosen, leaving the eye exposed to potential damage with increasing proximity of the IPL handpiece to the eye. To minimize these types of injuries, opaque ocular shields, such as stainless steel or plastic corneal shields that can be placed beneath the eyelids and conform to the globe, should always be used throughout the duration of IPL and laser procedures that treat on or near the eyelids. For practitioners who do not specialize in eye care and who may not be comfortable applying corneal shields, external metal goggles or adhesive eye shields should be used but not repositioned or removed at any time during the treatment.

As IPL is gaining popularity among physicians who use this treatment to address a multitude of problems, it is of utmost importance that the potential risk for permanent ocular damage be known and avoided. It is imperative that professionals who administer IPL treatments take extreme care in implementing precautionary measures and utilizing appropriate and reliable protective eyewear. The fact that IPL is a light device and not a laser may give people a false sense of security regarding damage to the eye. All physicians, especially ophthalmologists, should be able to recognize the signs and symptoms of IPL ocular damage and try to prevent permanent injuries to the iris similar to the ones presented in these and other cases.

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