**Acute Cataract Development in a 43-Year-Old Woman After an Ultrasound Eyelid-Tightening Procedure**

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**Short title: Acute cataract after ultrasound eyelid tightening**

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**Abstract**

A 43-year-old woman presented to the emergency room with bilateral acute cataract compromising her vision several hours after undergoing an eyelid-tightening procedure using intense focused ultrasound (IFUS). Her vision was decreased more in the right eye than the left. Several weeks later, vision decreased to 6/120 in the right eye and she underwent uneventful laser-assisted cataract surgery with intraocular lens implantation, leading to full visual recovery. The cataract that developed was unusual in appearance and in consistency. This case emphasizes the need for special awareness of possible side effects to periocular IFUS, including severe ocular impact requiring surgical intervention.

Cosmetic treatments are becoming increasingly popular. One such treatment applies intense focused ultrasound (IFUS) to the surface of the skin, which delivers heat to the dermis and subdermis and causes increase of collagen.1 Through the process of healing, the skin is tightened. IFUS has been approved for eyebrow, neck, and submentum skin lifting.2

The side-effect profile of IFUS is generally considered acceptable and usually comprises erythema, mild pain, and mild tenderness without any long-term adverse effects or ocular involvement.,2 We describe here a case of severe ocular involvement, acute cataract formation, following IFUS.

# Case Report

A 43-year-old female patient presented to the emergency room with red, painful eyelids in the right eye several hours after periocular skin treatment with IFUS for eyelid laxity. Her medical and ocular history were unremarkable. She had had an uneventful photorefractive keratectomy 7 years previously, with uneventful follow-up: documented plano refraction and 6/6 vision in both eyes 6 months postoperatively.

Examination of the right eye revealed visual acuity of 6/20, a red and painful eyelid, clear cornea, deep and quiet anterior chamber, and pupil round and reactive to light. The lens was noted to have four spots of cataract with a raindrop-like configuration and posterior subcapsular cataract with a flower shape. The left eye had preserved vision (6/6). The lens in the left eye had one area of opacification. The retina, optic nerve, and vitreous were unremarkable in both eyes.

The patient was given dexamethasone eye drops and asked to return for follow-up 2 days later. On the second visit, the visual acuity had worsened to 6/40 in the right eye but remained 6/6 in the left. The cataract had progressed in the right eye and cells were noted in the anterior chamber. Ultrasound, which was performed because the view of the fundus was poor, was unremarkable.

One month after the first presentation, the patient presented to Enaim medical center for a second opinion. The right eye refraction was -4.00 -1.5 × 140 with a best corrected visual acuity of 6/120. The refraction of the left eye was 0 -0.50 × 180 and the best corrected visual acuitywas 6/6. The right eye was noted to have severe and visually significant cataract (Figure 1); the left eye had one area of opacification (Figure 2). The RE cataract was sever and no view of the fondus was avilbule. Ultrasound imaging form the ER visit was normal. Corneal tomography was similar to the one done at last post op examination after her uneventhul PRK treatment (figure 3).

Femtosecond laser-assisted cataract surgery with implantation of a monofocal intraocular lens (IOL) was performed in the right eye (Video 1, Figure 3). The cataract surgery was uneventful; however, the surgeon (SL) noted that the cataract was stickier in consistency than usual. Despite the 1.5 D of astigmatism noted in the pre-op examination, it was decided not to implant a toric IOL because of fear that the lens zonules might also have been damaged by the IFUS, which might compromise the stability of the IOL. At 10 days postoperatively the uncorrected visual acuity in the right eye was 6/7.5. At 1 month postoperatively, vision was stable at 6/7.5 in the right eye and 6/6 in the left eye. At the last exam, 9 months postoperatively, the vision was 6/6 in both eyes. Post- operative macular and nerve fiber layer was normal in both eyes (figure 3).

# Discussion

We present the case of a 43-year-old woman who developed acute cataract several hours after treatment with IFUS. Lens opacities, noted in both eyes, were only significant in the right eye. The patient required cataract surgery to restore her vision.

Although IFUS is generally considered a safe procedure, there have been several reports of ocular damage associated with it, some of which—as in our case—required cataract surgery for visual rehabilitation. Jung et al.3 were the first to publish such an association. In their report, the patient was noted to have an acute corneal trauma, and as a consequence astigmatism, shortly after treatment with IFUS. With topical steroid treatment, the patient improved and the astigmatism decreased. Chen and colleagues4 reported another case, with a more severe ocular impact. The patient was noted to have increased intraocular pressure, iris damage, and an acute myopic shift accompanied by spasm of accommodation. A relative afferent pupillary defect was present as well. That patient regained partial vision after treatment, with cycloplegia. Recently kashfi et. al5 published similar cataract formation after IFUS in a unilateral case. The shape of the cataract was similar to the one that was formed in our case but was not visually significant and was not treated.

Both of our patient’s eyes, but mainly the right, were affected by an unusual cataract. This type and speed of cataract formation is not a normal development. The patient’s young age, the shape and consistency of the cataract, and the acute visual fall several hours after painful IFUS treatment all pointed to a cataract developed as a result of the treatment. Moreover, the similarity to the shape of the cataract in pervious case5 signify that the cataract in our patient is the result of her IFUS treatment.

IFUS uses ultrasound energy to cause zones of thermal coagulation.6 The eyelid skin is some of the thinnest in the human body7 and thus may be especially susceptible to transmission of thermal energy. We suspect that the injuries to ocular structures are caused by heat, which can cause an inflammatory reaction, as indicated by the cells that were seen in the anterior chamber of our patient at the 1-day post emergency room visit.

Although IFUS is not commonly used in the periorbital area, Suh and colleagues reported its use in 15 patients.8 They noted no serious, permanent, or delayed side effects in the 6 months’ follow up.

It is interesting to note that the diameter of the injury in the previous case reports and in our case are similar, but different structures of the eye are affected: the cornea,3 iris,4 and lens (this case). This difference may lie in the duration of the treatment and/or the probe used.

Animal experiments during the 1980s tested the use of IFUS to create a small localized cataract, thus preventing the development of generalized cataract, after the traumatic rupture of the lens capsule.9 The article included an image of a lens treated with discrete mode that is very similar to the size of lens opacities shown in our patient.

Our patient had received IFUS from a beautician rather than a certified medical doctor. This and the other case reports emphasize the need for special attention when IFUS is applied in the periocular area and call for a medical doctor to supervise this procedure when performed close to the eyes.

# Value Statement

# What was known

# Intense focused ultrasound is used for skin tightening.

# Intense focused ultrasound in the eyelid area usually has minimal complications.

# What This Paper Adds

# Intense focused ultrasound can cause acute vision-threatening cataract.

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# Figure Legends

**Figure 1.** Right eye, 1 month after the initial emergency room presentation. Several opacifications are observed, noted as acute cataract. *A*: Three of the four areas of cataract are noticeable (red arrows). Note the small areas of opacification between the large ones (black arrow). *B*: Larger magnification of the right eye.

**Figure 2.** Left eye, showing mild lens opacification.

**Figure 3:** corneal topography and optical coherence tomography

A: Both eye, normal corneal topography using Orbscan before the refractive surgery at year 2012.

B+C: Both eyes showing normal post myopic treatment corneal tomography using Sirius tomography, after the cataract had developed. The tomography dose not demonstrate damage to the coronae secondary to IFUS.

D+E: optical coherence tomography of the retina of both eyes is presented. This image was taken after the surgery in the right eye, as no view of the fundus was possible before the surgery. The left eye underwent OCT at the time of diagnosis of the cataract that was normal (not shown).

**Figure 4.** Intra-operative images of the uneventful femtosecond laser-assisted cataract surgery. *A*: Femtosecond laser image demonstrating the cataract area (red arrow). *B*: After capsulorhexis and breaking of the lens with the femtosecond laser. The white areas are the cataract: one is indicated by the red arrow. *C*: After nucleus removal. The cortex is noted to contain some of the cataract material. *D*: The cataract material outside of the eye. It was composed of distinct parts that were able to be grabbed by forceps. *E*: End of the surgery, intraocular lens in the bag.

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