Signs, intraoperative challenges, and management strategies during cataract surgery secondary to inadvertent intralenticular antivascular endothelial growth factor injection

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We report the case of a 74-year-old woman who attended our outpatient department complaining of decreased vision in her right eye. Three years previously, an intravitreal injection (bevacizumab [Avastin]) had been given for diabetic macular edema. Slitlamp examination showed immature cataract. Preoperative anterior segment optical coherence tomography (AS-OCT) of femtosecond laser–assisted cataract surgery showed a deposit over a potentially compromised posterior lens capsule that was not evident on slitlamp examination. The intraoperative challenges during cataract surgery and the management strategies used for a satisfactory clinical outcome are described. To our knowledge, this is the first report of AS-OCT performed during femtosecond laser–assisted cataract surgery detecting a potentially compromised posterior lens capsule after intravitreal injection.

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Intravitreal antivascular endothelial growth factor (VEGF) injections are used for various retinal diseases including diabetic retinopathy (DR), vascular occlusions, and age-related macular degeneration. Intravitreal injections can be associated with complications such as raised intraocular pressure (IOP), sterile and infectious endophthalmitis, cataract formation or progression, intraocular hemorrhage, and retinal detachment. Cataract surgery in a case with a preexisting posterior capsule tear in which lens injury occurs during intravitreal injection is a challenge. We describe the use of intraoperative anterior segment optical coherence tomography (AS-OCT) to detect a preexisting posterior capsule tear and the appropriate management.

CASE REPORT

A 74-year-old woman attended our outpatient department complaining of decreased vision in the right eye in 2014. There was a history of uncomplicated intravitreal anti-VEGF injection for diabetic macular edema in both eyes in 2011.

On presentation, the corrected visual acuity was 20/60 in the right eye and 20/30 in the left eye. The IOP was 14 mm Hg and 15 mm Hg, respectively. The anterior segment was within normal limits except for the presence of bilateral immature cataracts. Indirect ophthalmoscopy revealed moderate nonproliferative DR with no clinically significant macular edema in the right eye and a spongy macula with an epiretinal membrane in the left eye. A decision was made to perform phacoemulsification with intraocular lens (IOL) implantation.

Femtosecond laser–assisted cataract surgery was performed (Figure 1, A) using the Lensx platform (Alcon Laboratories, Inc.). After the capsulotomy was completed, careful hydrodissection and hydrodelineation of the nucleus were performed using a balanced salt solution. Nucleus rotation
was normal, as can be seen in Video 1. However, during emulsification of the nuclear pieces, the lenticular fibers appeared more leathery than expected for the grade of nuclear sclerosis; ie, the nucleus had been fragmented by the femtosecond laser using a 400 μm grid pattern in the central 3.0 mm diameter of the nucleus, with radiating 1.5 mm spokes along with a posterior offset of 500 μm, which left a very thin posterior plate between the nucleus and posterior capsule and should have led to easy separation of the nucleus. A posterior capsule tear was noticed during emulsification of the last nuclear piece (Figure 1, B), which was safely emulsified after an ophthalmic viscosurgical device was injected beneath it. After thorough automated anterior vitrectomy (cut rate 4000/sec, vacuum 250 mm Hg, aspiration 25 mL/min) and careful irrigation/aspiration, a 3-piece foldable IOL was placed in the sulcus with the optic captured behind the capsulorhexis margin (Figure 1, C).

On postoperative day 1, the uncorrected distance visual acuity (UDVA) was 20/20 and the IOP was 14 mm Hg. At the final follow-up at 5 months, the UDVA was 20/20 and the IOP, 13 mm Hg.

To identify the cause of the posterior capsule tear, AS-OCT images taken during the surgery by the laser were reviewed. The images revealed deposits in the center of the posterior capsule (Figure 2) that were not evident on the preoperative slitlamp examination. The deposits were presumed to be anti-VEGF, but this could not be confirmed. To our knowledge, this is the first report of AS-OCT during femtosecond laser–assisted cataract surgery detecting a deposit of bevacizumab (Avastin) on the posterior lens capsule after intravitreal injection.

**DISCUSSION**

Accidental lens touch causing cataract formation, lens dislocation, zonular fiber tears, and accidental intralenticular injections has been reported after an intravitreal injection. The reasons could be improper technique, surgeon inexperience, or patient’s head movement at the time of injection. Surgeons should be aware of this possibility not only for counseling patients preoperatively, but also for anticipating and managing this complication intraoperatively. Preoperative AS-OCT to detect potential compromise of the posterior capsule could be a useful diagnostic tool in

Figure 1. A: Operating microscope screenshot after femtosecond laser–assisted cataract surgery before phacoemulsification has started. B: Posterior capsule tear (edges marked with red arrows) when first detected. C: Slitlamp photograph on postoperative day 1 showing optic capture by the capsulorhexis margin of the haptics of a 3-piece IOL in the sulcus.

Figure 2. Anterior-segment OCT images showing deposits (red box), presumably from the anti-VEGF injection, over the posterior capsule in the circle scan (A) and in the line scan (B).
cases with a history of intravitreal injections having cataract surgery as cataract progression may be slow and a preexisting posterior capsule tear may not be suspected on clinical examination.

In our case, the posterior capsule trauma was not suspected preoperatively but discovered intraoperatively; hence, hydrodissection with nuclear rotation was done. However, in cases in which preexisting posterior capsule trauma is suspected, hydrodelineation with rotationless chop as described by Vajpayee et al. should be followed as standard of care.

In other cases of iatrogenic lenticular trauma, there is generally rapid progression of cataract; however, in our case, that did not happen. Khalifa and Pantanelli reported a similar case in which the cataract did not progress after trauma to the posterior capsule, even after 17 intravitreal injections. They described the posterior capsule defect as “healed.” A similarly healed posterior capsule tear along with the changed leathery nature of lens fibers could explain why nuclear pieces remained stable during phacoemulsification. The leathery nature of the lens might be attributable to long-term exposure of the lenticular tissue to the deposits of anti-VEGF on the posterior capsule. Additionally, as there was no lens fiber hydration, AS-OCT was able to detect the deposition of the chemical. It could potentially identify the iatrogenic discontinuity in the posterior capsule preoperatively.

With increasing use of intravitreal injections, the possibility of iatrogenic posterior capsule damage should be considered at the time of cataract surgery in eyes that have had such injections. Cataract surgeons should have the necessary vitrectomy equipment and appropriate surgical technique to manage the posterior capsule tears. Multipiece IOLs could be placed in the sulcus with optic capture by the capsulorhexis margins to ensure long-term centration and stability of the IOLs.

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