CASE REPORT

Large Hyphema Following Femtosecond Laser-assisted Cataract Surgery (FLACS) and Trabectome Resulting in Endocapsular Hematoma

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Abstract

Aim: To report a large hyphema following femtosecond laser-assisted cataract surgery (FLACS) and trabectome resulting in endocapsular hematoma.

Background: Hyphema has previously been described following trabectome, however, no cases have been reported following FLACS or FLACS combined with microinvasive glaucoma surgery (MIGS). We report a case of a large hyphema following FLACS combined with MIGS that resulted in an endocapsular hematoma.

Case description: A 63-year-old myopic female with exfoliation glaucoma underwent FLACS with a trifocal intraocular lens implant and Trabectome in the right eye. Significant intraoperative bleeding ensued following the trabectome and was treated with viscoelastic tamponade, anterior chamber (AC) washout, and cautery. The patient developed a large hyphema with intraocular pressure (IOP) rise that was treated with multiple AC taps, paracentesis, and eye drops. The hyphema took approximately 1 month to completely clear, leaving an endocapsular hematoma. This was treated successfully with Neodymium:Yttrium-Aluminum-Garnet (Nd:YAG) laser posterior capsulotomy.

Conclusion: Hyphema may occur with angle-based MIGS in combination with FLACS and may cause endocapsular hematoma. An increase in episcleral venous pressure during the docking and suction phase of the laser may predispose to bleeding. Endocapsular hematoma is an uncommon finding after cataract surgery and may be treated with Nd:YAG posterior capsulotomy.

Keywords: Femtosecond, Hyphema, MIGS.

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Précis

Hyphema may occur following femtosecond laser-assisted cataract surgery and angle-based microinvasive surgery. If it persists, it may cause endocapsular hematoma, which may be treated with Neodymium:Yttrium-Aluminum-Garnet (Nd:YAG) laser posterior capsulotomy.

Background

Microinvasive glaucoma surgery (MIGS) is frequently combined with cataract surgery, with the goal of reducing IOP. Angle-based procedures are a category of MIGS that involves removing or bypassing the trabecular meshwork (TM). For MIGS procedures that involve incising TM such as goniotomy and trabeculotomy, the most common complication is transient hyphema from blood reflux.[1–4] It has been shown that hyphema is more common with incisional TM surgery than TM bypass, likely because unroofing of Schlemm's canal allows greater blood reflux.[5] Occasionally, there may be large hyphemas that take more time to clear and may even require AC washout.[6] This is associated with hyphema upon awakening after sleeping face down or toward the surgical site.[6]

Femtosecond laser-assisted cataract surgery (FLACS) has been gaining popularity in recent years, especially in conjunction with premium intraocular lens (IOL) implantation. FLACS has been demonstrated to be noninferior to traditional cataract surgery.[7] The precision of the capsulotomy has been shown to decrease IOL tilt and improve refractive results.[8] FLACS has also been shown to have lower rates of endothelial cell loss compared to traditional cataract surgery.[9] Reported complications with FLACS include suction break, anterior capsular tags, anterior capsular tears, free-floating capsulotomy, posterior capsular rupture, conjunctival hyperemia, conjunctival hemorrhage, miosis, and laser damage to the cornea endothelium.[10–12] However, hyphema has not been described as a complication of FLACS.

Endocapsular hematoma, initially described as "in-the-bag" hyphema, is a postoperative complication where blood accumulates in the capsular bag after cataract surgery.[13,14] The location of blood is between the posterior surface of the intraocular lens and the anterior surface of the posterior capsule.[14] This location makes it difficult for endocapsular hematomas to resorb.[14–19] Seclusion from aqueous and stasis of blood contribute to the chronicity of endocapsular hematomas. Compared to hyphema, endocapsular hematoma requires less blood to cause

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visually significant symptoms.[14] Endocapsular hematoma has been described following extracapsular cataract extraction and posterior chamber intraocular lens implantation.[14,15] It has also been described with phacoemulsification,[16] glaucoma surgery,[17] and penetrating deep sclerectomy.[18] At times, the blood will spontaneously resorb or its presence may not cause decreased vision.[15] Persistent endocapsular hematoma causing visual acuity decrease may be treated with Nd:YAG laser capsulotomy, which allows blood to drain into the vitreous cavity and resorb.[14,16–19]

To our knowledge, we present the first case of hyphema after FLACS, which was combined with the trabectome. Postoperative endocapsular hematoma may occur, which may be treated successfully with Nd:YAG posterior capsulotomy.

Case Description

A 63-year-old myopic female with exfoliation glaucoma presented with a visually significant cataract in the right eye. The best corrected visual acuity (BCVA) was 20/60 and IOP was 20 mm Hg on Latanoprost. Her untreated IOP was 25 mm Hg. The right eye had a cup to a disc of 0.6, with an axial length of 26.42 mm and an AC depth of 3.43 mm. She had a grade 3 angle open to scleral spur with 3+ TM pigmentation. She elected to have cataract surgery with a femtosecond laser and wanted vision correction at all distances, so the decision was made to perform FLACS with a trifocal IOL (Panoptix, Alcon, Ft. Worth, TX, USA), Given that her angle was open and her IOP was slightly elevated, she was a candidate for angle based MIGS. The decision was made to perform trabectome (Microsurgical Technology, Redmond, WA, USA) in combination with cataract surgery. Past medical history included hypothyroidism and hyperlipidemia. She had no other medical conditions, was not on anticoagulation therapy, and did not have any coagulation disorder.

The capsulorhexis, nuclear divisions, and an arcuate incision were performed using the Catalys Precision Laser System (Johnson and Johnson, New Brunswick, NJ, USA) and there was no bleeding. She was then brought from the femtosecond laser room to the operating room for the manual portion of the surgery. A temporal paracentesis and temporal main wound were created, followed by injection of dispersive viscoelastic. Preparation for the trabectome was made by tilting the head and microscope. Upon placing the gonioprism, the angle was noted to be open, with a heavily pigmented TM and no blood noted in the Schlemms canal (Fig. 1). The trabectome was placed into the AC and was performed, ablating and removing 90 degrees of the TM. Upon completion of the trabectome, there was a copious amount of bleeding from the nasal angle incision. Additional dispersive viscoelastic was injected into the nasal angle to tamponade the bleeding.

The manual portion of the cataract surgery commenced. The head was tilted back to the ortho position and the microscope was positioned. The capsulorhexis was removed and phacoemulsification was performed. During the cataract surgery, there continued to be bleeding from the angle, for which more dispersive viscoelastic was injected into the angle to try to stop the bleeding. The blood was removed with irrigation and aspiration during the phacoemulsification and cortical clean-up. The intraocular lens was implanted. After the lens was injected and viscoelastic was removed, there was still a large amount of blood emanating from the angle. AC washout was performed with irrigation and aspiration and more dispersive viscoelastic was injected to tamponade the bleeding. The bleeding continued, so the decision was made to use a needle tip cautery to achieve hemostasis. The microscope was tilted, the head was rotated and with the assistance of a surgical gonioprism, cautery was applied to the bleeding area of the angle. Additional washout was performed and more dispersive viscoelastic was injected to tamponade the bleeding. The bleeding improved and the surgery was completed. Dispersive viscoelastic was retained in the eye to continue to serve as tamponade. Head of bed elevation and no straining were advised.

On postoperative day 1, the vision was hand motions with IOP 49 mm Hg. The AC had a 7 mm hyphema with 4+ microhyphema. B-scan ultrasound showed no vitreoretinal pathology. The paracentesis was tapped until the IOP decreased to 6 mm Hg. She was started on timolol-brimonidine and netarsudil in the right eye in addition to moxifloxacin, prednisolone, and ketorolac. The latanoprost was discontinued.

On postoperative day 2, the vision was hand motions and the IOP was 44 mm Hg. The AC had 2 mm of layered hyphema and 4+ microhyphema. There was no area of active bleeding. The paracentesis tap was repeated until the IOP was 24 mm Hg. On postoperative day 3, the vision was hand motions and the IOP was 21 mm Hg. The AC had 1.5 mm of layered hyphema with 4+

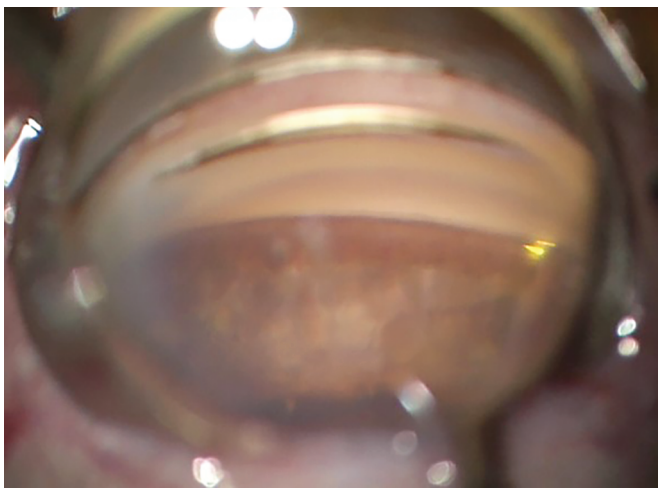


Fig. 1: Pigmented trabecular meshwork, with no blood, prior to the trabectome

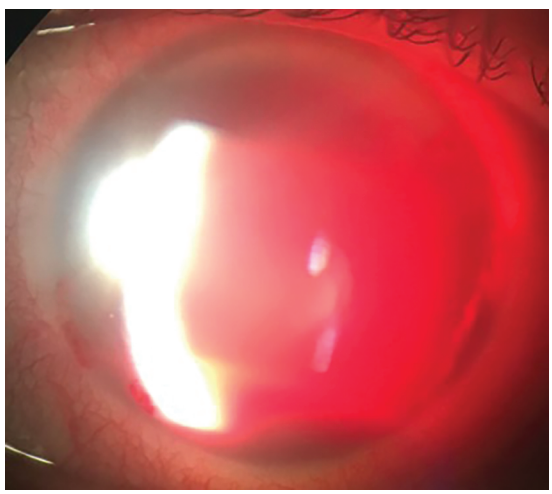
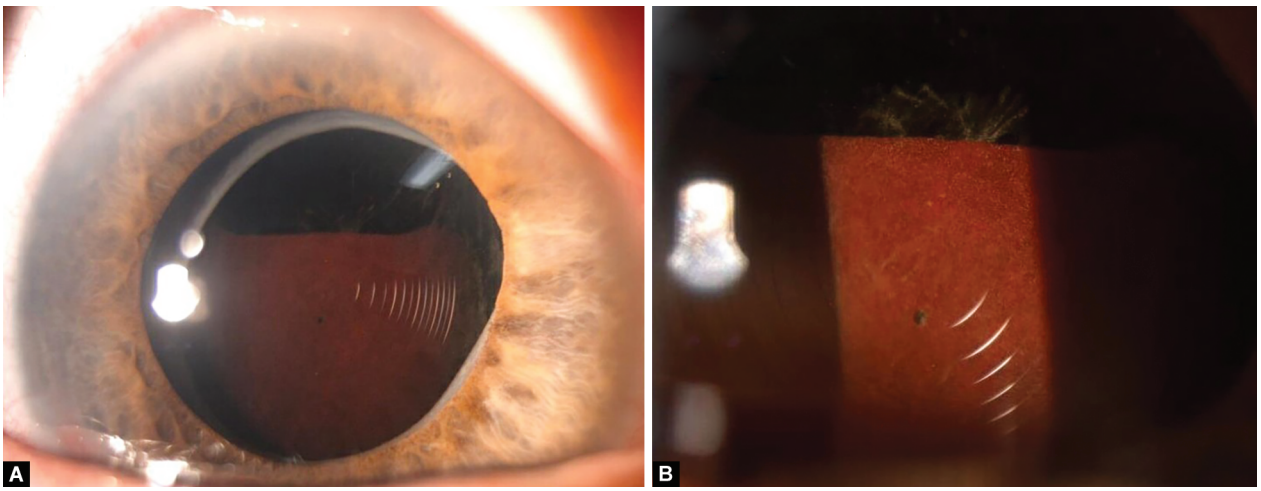


Fig. 2: Right eye with 1.5 mm of layered hyphema with 4+ microhyphema and a nasal blood clot



Figs 3A and B: Endocapsular hematoma with blood located posterior to the IOL and anterior to the posterior capsule

microhyphema and a nasal blood clot (Fig. 2). She was followed daily with improving hyphema and stable IOP. There was a rebleed on postoperative day 7 with an IOP increase to 51 mm Hg. An AC washout was considered, but the decision was made to continue with office-based management due to the possibility of continued bleeding with a surgical AC washout. A paracentesis was made, and wound tapping was repeated. The IOP stabilized on postoperative day 8 and onwards with resolving hyphema.

On postoperative day 18, the vision improved to 20/70, IOP was 13 mm Hg, and there were no clots or layered hyphema. There was remaining 4+ microhyphema. By postoperative month 1, the microhyphema had cleared, but there was an endocapsular hematoma present (Fig. 3). An Nd:YAG posterior capsulotomy was performed successfully. On the postsurgery month 9 visit, visual acuity was 20/25 with IOP 15 mm Hg on Brimonidine once daily.

Discussion

Postoperative hyphema is a commonly reported adverse event of trabectome, with a reported incidence of 59% on postoperative day 1.[2] This typically clears in about 1 week although recurrence has been reported.[2] There have also been reports of delayed onset hyphema, with a median onset of 8.6 months.[6] Our case involved a large amount of intraoperative bleeding after the trabectome, which involved incising and ablating the TM. The bleeding may not have been solely due to the TM removal with the trabectome. During the suction phase of FLACS, the docking and vacuum have been shown to cause an acute rise in IOP, which improves after the removal of the suction ring.[20,21] The suction may cause a rise in IOP of up to 38.8 mm Hg and could cause elevated episcleral venous pressure.[21] This could cause a buildup of blood in Schlemm's canal, which would explain a large amount of bleeding after the trabectome was performed. In our case, no blood was visible in Schlemm's canal prior to the trabectome, though it may have been present but not visible due to the heavy TM pigmentation.

Complications associated with AC bleeding have not been reported in FLACS.[10–12] The safety and efficacy of combining FLACS with two trabecular micro-bypass stents have been shown with no complications reported.[22] However, the safety and efficacy of combining FLACS with TM incising procedures such as trabectome have not been reported. As this combination becomes more widely used, further studies may be needed to elucidate a complete risk profile.

The use of ketorolac postoperatively may also have contributed to the persistent hyphema. This is due to the non-steroidal anti-inflammatory drug (NSAID) composition of ketorolac, which has antiplatelet properties and could theoretically increase the risk of bleeding.[23]

The endocapsular hematoma in our case was caused by blood spillover from the AC into the capsular bag. The blood became trapped between the IOL and posterior capsule, thus forming the endocapsular hematoma. The use of Nd:YAG capsulotomy for the treatment of endocapsular hematoma has been described.[14,16–19] In this case, a circular posterior capsulotomy using the Nd:YAG laser was created, which allowed the blood to migrate into the vitreous cavity and resorb. The patient responded well to the capsulotomy, with the improvement of visual acuity to 20/25 and resolution of the endocapsular hematoma.

Conclusion

Hyphema may occur with angle-based MIGS in combination with FLACS and may cause endocapsular hematoma. Endocapsular hematoma is an uncommon finding after cataract surgery and may be treated with Nd:YAG posterior capsulotomy.

Clinical Significance

Hyphema is something to be aware of when performing FLACS with angle-based MIGS that incise the TM. FLACS may potentially increase the risk of intraoperative bleeding when combined with these types of MIGS, given its suction and vacuum component.

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