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Case report

Femtosecond laser - Assisted cataract surgery in pediatric pyramidal anterior polar cataract

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ABSTRACT

Purpose: The purpose of this report is to describe the successful utilization of femtosecond laser assisted cataract surgery (FLACS) in a rare case of pyramidal anterior polar cataract in a female child.

Observations: The patient is a 6 years old girl that presented to the cornea clinic with a unilateral pyramidal cataract that was deemed to be visually significant, and therefore required cataract extraction and intraocular lens implantation surgery. FLACS was proposed and mother consented to proceed with the surgery. The femtosecond laser technology enabled precise completion of a central capsulotomy around the protruding pyramidal capsular lesion.

Conclusions and importance:conclusion: Various capsulorhexis techniques have been described and are used in pediatric cataracts including manual, can opener, vitrectorhexis, and laser, but none has become a standard. We propose the use of femtosecond laser for cataract extraction in cases of pediatric pyramidal cataracts, and hereby provide the first case report of such. The laser is a safe method for capsulorhexis construction and offers an additional advantage of intraoperative anterior segment OCT image guidance with visualization of the pyramidal lesion.

1. Introduction

Even for the experienced cataract surgeon, capsulorhexis in pediatric cataract remains challenging. The high capsular elasticity in children frequently leads to an oversized anterior capsulorhexis. Pyramidal cataracts represent a variant of anterior polar lens opacities and are a rare form of capsulolenticular cataracts. They are described as conical opacities that project into the anterior chamber and can be unilateral or bilateral.[1] The pyramidal lesion is surrounded with a variable degree and size of cortical opacification. There has been reports of pyramidal cataracts presenting as a foreign body in the anterior chamber after spontaneous dehiscence.[2] Etiology is unknown and limited information from literature is available due to its rarity. There are usually no systemic associations. Histopathological examination of the pyramidal lesions showed hyperplastic lens epithelium embedded in a collagenous matrix.[1] Depending on the size and degree of extension into the anterior chamber, capsulorrhexis can be challenging during surgical intervention. Few reports exist in the literature for the use of FLACS in children.[3–6] Our institute has previously reported the use of FLACS in a child with Peters anomaly type 2 and a significant cataract in the presence of central corneal opacification and corneolenticular adhesions.[7] We propose the use of femtosecond laser technology to perform a continuous capsulotomy in pediatric pyramidal cataract to improve precision, safety and reproducibility.

2. Case report

A 6 years old girl was referred to the cornea clinic at Illinois Eye and Ear Infirmary, University of Illinois at Chicago for a peculiar central whitish opacity in the left eye. Accompanying mother gave history of premature birth at 34 weeks of gestational age with 3 weeks stay at the neonatal intensive care unit (NICU). The child had no history of any chronic medical condition and was not using any medications. On examination, best corrected visual acuity was 20/20 in the right eye and 20/80 in the left eye with a difficult retinoscopy. Clinical exam was unremarkable for the right eye, but showed central capsulolenticular opacification in the left eye. Lens opacity was central and had a peculiar conical or pyramidal extension into the anterior chamber (Fig. 1 A, B). Cornea was clear in both eyes and fundus exam was unremarkable except for myelinated nerve fiber layer around the optic discs bilaterally.

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Preoperative anterior segment optical coherence tomography (AS-OCT) was found useful to depict the pyramidal lesion and confirm its connection to the anterior lens capsule (Fig. 1C). The lesion was in the visual axis, larger than 3 mm and covering most of the mesopic pupil, and therefore deemed to be visually significant. Informed consent for cataract extraction and intraocular lens implantation was obtained from the patient's mother. The day of the surgery, general anesthesia was induced in the operating room and then the patient was transported to the laser suite located in a contiguous room. At all times, the patient had full attention from the anesthesia team and complete anesthesia monitoring was performed in both rooms. Prior coordination with the anesthesia team is very important to ensure the child can be safely anesthetized with appropriate monitoring during the laser portion of the procedure, and safely transported from and to the main operating room. Topical anesthetic eye drop was instilled and a Lieberman speculum was used. Docking was successful using the standard applanating curved contact lens patient interface. Anterior capsulotomy was performed using the femtosecond laser system (LenSx Laser System, Novartis Inc, Basel, Switzerland). Capsulotomy diameter was chosen to be 4.8 mm and energy used was 5 μJ. Live intraoperative OCT allowed for visualization of the pyramidal lesion and guided treatment. The patient was then transported back to the main operating room, prepped and draped in the standard sterile fashion. A 2.4 mm superior biplanar clear corneal wound and 2 paracenteses were created for bimanual technique. Viscoelastic was injected into the anterior chamber and the anterior capsule was carefully inspected. The capsulorhexis was found to be central, rounded and complete with no capsular tags or tears. The pyramidal lens opacity remained attached to the anterior capsular flap. The pyramidal lesion felt rubbery and slippery and was removed with Utrata forceps through the main wound without complications. Lens material was aspirated using bi-manual irrigation aspiration method. Anterior and posterior capsules were polished meticulously and a posterior chamber single piece Tecnis ZCBOO intraocular lens was placed in the capsular bag (video 1). Posterior capsulotomy was not considered because the child was found cooperative enough to successfully perform Nd:YAG-laser posterior capsulotomy in the future if needed. Postoperative course was unremarkable with a standard treatment course of topical antibiotics and prednisolone acetate 1% eye drops. The child did very well and was later referred to the pediatrics clinic for refraction and management of amblyopia. Occlusion therapy was prescribed for 3 hours daily to the unaffected eye. Unfortunately, compliance with patching and with follow up visits was inconsistent. At 1-year postoperatively, best corrected visual acuity was improved to 20/60. In this case we believe amblyopia had 2 components; sensory deprivation from the cataract and a refractive/anisometropic element from a 2.75 D of corneal astigmatism that was not present in the other eye. Further improvement might be possible with more strict patching therapy.

3. Discussion

Continuous curvilinear capsulorhexis is often difficult to perform in children. Compared to an adult, more force is needed to tear the highly elastic anterior lens capsule of a child. Radial tears and oversizing are common, and prevention of anterior tears is more difficult.[8–10] Because of its central location and rubbery firm nature, a pyramidal cataract in a child is thought to add difficulty to the critical capsulorhexis step during surgery. Anterior polar lens opacities less than 3 mm in diameter are thought to be non-visually significant and can be observed or treated with mydriatic eye drops to dilate the pupil past the opacity.[1,9] Larger lens opacities are considered visually significant and cataract extraction should be considered. In these more severe cases, deprivation amblyopia is commonly present. There is limited evidence in the literature reporting the use of femtosecond laser in pediatric cataract cases.[3–6] Here we report the successful use of FLACS in a pediatric pyramidal cataract and propose that this technique be considered as an option in such cases. To the best of our knowledge there has been no reports of prior use of femtosecond laser in cases of pyramidal cataracts. Femtosecond laser assisted capsulorhexis in pediatric pyramidal cataracts gives the surgeon the option of avoiding the pyramidal capsular lesion and perfectly sizing and centering the capsulorhexis with increased safety. We believe femtosecond laser assisted capsulorhexis is superior to manual techniques in these cases but further studies are needed to confirm this.

4. Conclusion

Pyramidal cataracts most likely represents a rare variant of anterior polar cataracts that features opacification and conical extension of the

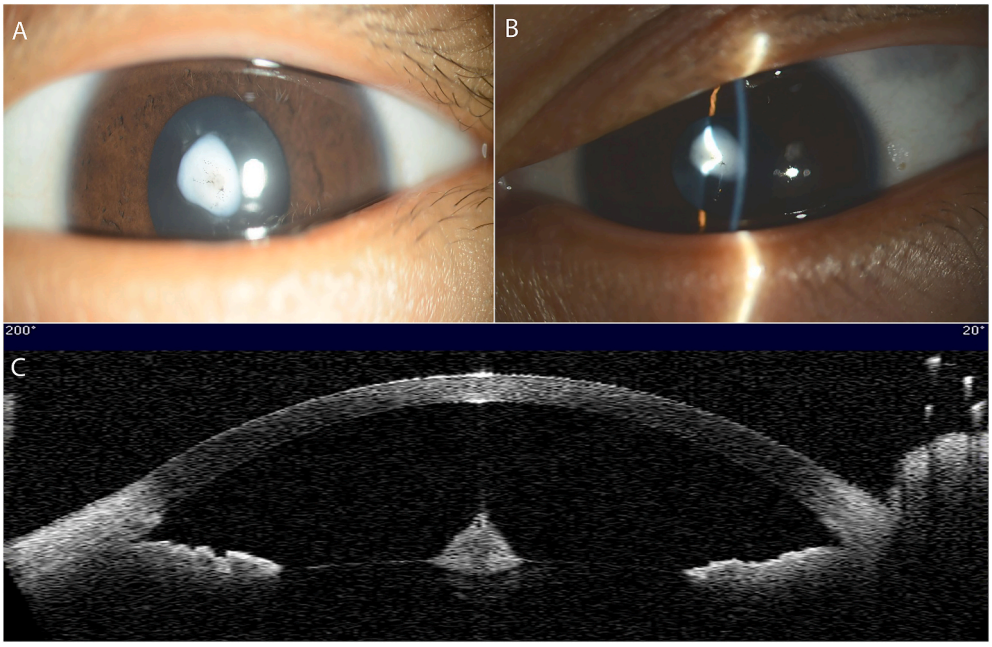

Fig. 1. A: Cataract in mid-dilated pupil, B: slit lamp optical section showing the pyramidal extension, C: AS-OCT showing the capsular pyramidal lesion. AS-OCT: Anterior segment optical coherence tomography.

anterior capsule with a variable degree of surrounding cortical cataract.[1] In visually significant cases femtosecond laser-assisted cataract surgery can be performed successfully. The femtosecond laser can be used for the construction of a continuous capsulotomy around the pyramidal lesion potentially increasing precision, safety and reproducibility of this critical step.

Patient consent

Consent to publish this case report could not be obtained as the patient was lost to follow-up. This report does not contain any personal information that could lead to the identification of the patient.

Video Legend

Video1: Femtosecond laser assisted capsulotomy followed by bimanual irrigation aspiration cataract extraction and placement of a hydrophobic single piece intraocular lens into the capsular bag.

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Research ethics

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ajoc.2020.100837.

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