



Prophylactic anterior vitrectomy during cataract surgery in eyes at increased risk for aqueous misdirection

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ABSTRACT

Purpose: Patients with chronic narrow angle glaucoma (CNAG) are at increased risk of developing aqueous misdirection (AM) following intraocular surgery. We present a retrospective case series on the use of posterior capsulorrhexis with core vitrectomy by an anterior approach (CAV) at the time of cataract extraction with or without glaucoma surgery as a prophylactic measure for the prevention of AM in CNAG.

Methods: Retrospective case series of six phakic eyes in four patients with CNAG and other risk factors for AM who underwent posterior capsulorrhexis and CAV at the time of cataract surgery with or without glaucoma surgery. The main outcome measures were best-corrected visual acuity (BCVA), intraocular pressure (IOP), and post-operative complications.

Results: Six eyes in four subjects underwent posterior capsulorrhexis with CAV at the time of cataract surgery. The case was combined with incisional glaucoma surgery in the five eyes with advanced visual field loss. The mean logMAR BCVA and IOP improved from 0.554 ± 0.398 and 25.2 ± 13 mmHg, respectively, at the pre-operative visit to 0.257 ± 0.218 and 12.2 ± 1.7 mmHg, respectively, at final follow-up. Both eyes with nanophthalmos developed non-appositional serous choroidals that resolved with atropine, but the left eye required additional treatment with synechiolysis, intraocular lens repositioning, limited AV and endocyclophotocoagulation. There were no permanent, vision-threatening complications.

Conclusions and importance: CAV can be safely combined with cataract surgery and glaucoma surgery, and it may be an effective intervention in eyes with CNAG and other risk factors for AM as a prophylactic measure against the development of AM.

1. Introduction

Aqueous misdirection (AM) is a rare, vision-threatening form of secondary angle closure glaucoma that can occur following incisional glaucoma or cataract surgery for chronic narrow angle glaucoma (CNAG).¹ When AM proves refractory to medical or laser therapy, vitrectomy by either an anterior^{2–4} or pars plana^{5–8} approach is pursued. Whether AM can be prevented in high-risk eyes is not known. Chaundry et al. reported on the safe use of pars plana vitrectomy (PPV) as a prophylactic measure at the time of cataract surgery in two patients with a history of contralateral AM.⁹ We present on the use of prophylactic core vitrectomy by an anterior approach (CAV) at the time of phacoemulsification with or without incisional glaucoma surgery in eyes at risk for AM.

2. Methods

We conducted a retrospective case series of 6 eyes in 4 patients with CNAG and visually significant cataract evaluated by the Duke Eye Center glaucoma service between August 1, 2014 and June 1, 2017 with follow-up through September 1, 2017. This study was approved by the Duke University Institutional Review Board with a waiver of informed consent.

All eyes had risk factors that placed them at increased risk for post-operative aqueous misdirection, such as CNAG and short axial length (AL) and/or anterior chamber depth (ACD), nanophthalmos, plateau iris, high pre-operative intraocular pressure (IOP), or history of contralateral AM.¹ Demographic and clinical data were collected including age, sex, race, intraocular pressure (IOP) by Goldmann applanation, Snellen best-corrected visual acuity (BCVA), AL and ACD (EyeSuite™ Biometry, LenStar 900, Haag-Streit Diagnostics), peripapillary retinal nerve fiber layer (RNFL) on Spectral Domain-Optical Coherence

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Tomography (Spectralis®, Heidelberg, Germany), mean deviation (MD) and pattern standard deviation (PSD) on SITA-fast 24-2 Humphrey visual field (HVF) (Carl Zeiss Meditec). HVFs were reviewed (ACT) for reliability parameters (< 33% fixation losses, false positive or false negatives) and severity was graded according to the American Academy of Ophthalmology's Preferred Practice Guidelines.¹⁰ BCVA was converted to logMAR units. Operative reports and clinical notes were reviewed for medical and surgical management and post-operative complications.

2.1. Surgical procedure

All surgeries were performed by an experienced glaucoma surgeon (PC). After creation of a clear cornea paracentesis with a Supersharp blade, the eye was filled with dispersive viscoelastic (VISCOAT, Alcon, Fort Worth, TX), and a beveled clear corneal incision was created approximately 90° away with a 2.2-mm-wide keratome blade. Additional steps to optimize visualization of the capsule, such as synechiolysis or insertion of a Malyugin ring, were performed as needed. A 5.5-mm continuous curvilinear anterior capsulorhexis was created with a cystotome and Utrata forceps. Phacoemulsification of the nucleus and irrigation-aspiration (I/A) of the cortex were performed.

The bag was re-inflated with cohesive viscoelastic (PROVISC, Alcon, Fort Worth, TX), and a 4.5 mm continuous capsulorhexis of the posterior capsule was created using a cystotome and Utrata forceps (Fig. 1A–C). Next, a coaxial 21-gauge vitrector was placed through the posterior capsule into the anterior hyaloid and a limited core vitrectomy by an anterior approach was performed at a rate of 800 cuts per minute on cut-I/A mode (Fig. 1D). If a patent iridotomy (PI) did not already exist, then a surgical iridectomy was created with the vitrector. Viscoelastic was injected into the anterior chamber prior to removal of the instruments to help prevent efflux of fluid. The wounds were tested with a Weck-cel sponge to ensure no vitreous was present. Additional viscoelastic was injected into the capsular bag followed by a foldable single-piece posterior chamber intraocular lens (IOL) (Acrysof SN60WF, Alcon). Once viscoelastic had been removed with the I/A handpiece, the corneal wounds were hydrated with balanced salt solution and the

main wound was secured with a 10-0 nylon suture. The five eyes with severe field loss underwent incisional glaucoma surgery (Table 1) after completion of these steps. Subconjunctival antibiotic and steroid were administered at the end of the case.

3. Results

Table 1 displays demographic and clinical data for each eye. The mean age was 72.3 ± 3.1 years. Five of the six eyes presented with advanced field loss (mean pre-operative MD -23 ± 8 dB, PSD 7.3 ± 2.2 dB). The average RNFL was 62.5 ± 19 microns. The mean AL was 21 ± 2.8 mm and ACD was 2.2 ± 0.65 mm. One subject had nanophthalmos in both eyes (right eye AL 17.6 mm, ACD 1.65 mm; left eye AL 17.48 mm, ACD 1.66 mm). All of the eyes were closed on gonioscopy, and one eye also had plateau iris.

Subjects were followed for an average of 17 ± 13.5 months. The mean logMAR BCVA was 0.554 ± 0.398 (Snellen BCVA ~20/71) at the pre-operative visit, 0.746 ± 0.271 (Snellen BCVA ~20/111) on post-op day one, and 0.257 ± 0.218 (Snellen BCVA ~20/36) at final follow-up. The average IOP at the pre-operative visit was 25.2 ± 13 mmHg, but improved to 13.3 ± 8.0 mmHg on post-op day one and 12.2 ± 1.7 mmHg at final follow-up.

Four eyes had no post-operative complications. Both eyes with nanophthalmos developed non-appositional serous choroidals that resolved with atropine. At the two-month post-op visit, the left nanophthalmic eye had persistent peripheral and central shallowing of the anterior chamber and BCVA of 20/100 despite atropine and aqueous suppression because there were shallow peripheral choroidals on B-scan. The IOP was only 12 mmHg. At post-op month four, the choroidals had resolved on B-scan, but the left eye was still shallow because posterior synechiae were causing the IOL to be tilted; the IOP was 10 mmHg. Since the IOL was tilted, she was taken to the operating room for synechiolysis, IOL repositioning, limited AV, and endoscopic cyclophotocoagulation, with subsequent deepening of the anterior chamber and improvement in the visual acuity to 20/40.

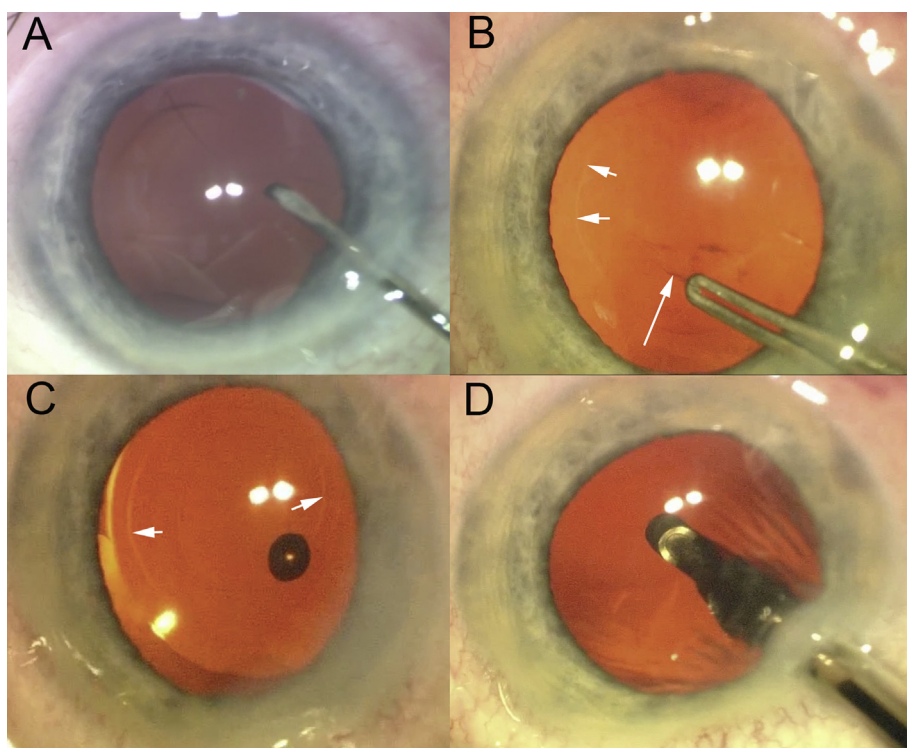


Fig. 1. Demonstration of the use of a cystotome blade (A) and Utrata forceps (B) to grasp and carefully guide the posterior capsule flap (long arrow) during the creation of a (C) 4.5 mm continuous capsulorhexis (short arrows) in the posterior capsule of eyes with chronic narrow angle glaucoma and risk factors for aqueous misdirection following phacoemulsification of the cataract. (D) Limited anterior core vitrectomy was performed (cut-I/A mode at 800 cuts/minute) by placing a coaxial 21-gauge vitrector through the posterior capsule into the anterior hyaloid face.

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