ARTICLE

Patient characteristics and outcomes of retained lens fragments in the anterior chamber after uneventful phacoemulsification

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Purpose: To determine patient characteristics and outcomes for developing retained nuclear fragments in the anterior chamber after phacoemulsification in at-risk populations.

Setting: University of Arkansas for Medical Sciences, Jones Eye Institute, Little Rock, Arkansas, USA.

Design: Retrospective case series.

Methods: Using Current Procedural Terminology codes 2006 to 2018, patients with a diagnosis of retained nuclear fragment in the anterior chamber after uncomplicated phacoemulsification cataract extraction were identified. Patient demographics, ocular biometrics, treatments, and clinical management were recorded. Main outcome measures were visual outcomes and visual acuity at regular follow-up appointments.

Results: Nineteen patients (13 with myopia) were identified. Most patients (n = 15) presented with corneal edema and anterior chamber inflammation, and the fragments were diagnosed on slit-lamp examination in most patients (n = 18). Seventeen retained fragments were found in the inferior angle. The mean axial length, keratometry, and anterior chamber depth (ACD) values were 23.58 mm, 44.93 diopters, and 2.97 mm, respectively. The mean time from cataract extraction to fragment removal was 34.7 days. The final corrected distance visual acuity ranged from 20/20 to 20/400. Three patients developed cystoid macular edema, and 2 patients had corneal complications after fragment removal.

Conclusions: A comparison between the patients in this study and cited cases indicates that long eyes, steep corneas, and a shallow ACD might be risk factors for retained nuclear fragments in patients having cataract extraction. Prompt identification and surgical removal provided the best visual outcomes because most cases proved refractory to steroid treatment.

J Cataract Refract Surg 2018; 44:848–855 © 2018 ASCRS and ESCRS

Although retained nuclear fragments are an uncommon occurrence during phacoemulsification,[1] small lens fragments can become lodged in the anterior chamber and result in eye inflammation and edema. These fragments often remain in the anterior chamber for a few day to weeks before being identified; however, in a small number of cases, these fragments can remain lodged asymptomatically for months or years before presenting as iritis or uvetis.[2–4] Retained fragments can cause reduced visual acuity, pain, and inflammation, all of which can be reversed by timely intervention.[5]

Because retained fragments are a relatively rare occurrence, few studies have sought to explain why some patients are more likely to have lens fragments that remain undetected during phacoemulsification by analyzing patient demographics and ocular biometrics. A consensus remains elusive; however, some studies point to a long axial length (AL), deep anterior chamber, and steep cornea as probable factors[2,5–8] and some report otherwise.[4,9–11] With the number of cataract surgeries predicted to increase with an aging U.S. population, there is a need to further describe these potential risk factors to help guide management and outcomes.

At present, cataract extraction is one of the most commonly performed surgical procedures in the U.S., and all physicians might have to deal with the challenge of finding a retained nuclear fragment and deciding the best course for management.[12] The purpose of this study was

Submitted: September 30, 2016 | Final revision submitted: January 27, 2018 | Accepted: February 17, 2018

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The Science Communication Group at the University of Arkansas for Medical Sciences, Little Rock, Arkansas, USA, provided editorial assistance.

Presented at the annual meeting of the American Society of Cataract and Refractive Surgery, Washington, DC, USA, April 2018.

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0886-3350/$ - see frontmatter
https://doi.org/10.1016/j.jcrs.2018.03.034

to perform a retrospective chart review of clinical features, treatments, and outcomes in a series of patients who were diagnosed with retained nuclear fragments in the anterior chamber after uneventful phacoemulsification cataract extraction. In addition, we assessed possible risk factors patients shared and performed a review of existing published cases in the literature to characterize management outcomes and delineate common findings.

PATIENTS AND METHODS

The University of Arkansas for Medical Sciences (UAMS) Human Subjects Committee (protocol 206220) approved this study. The research was performed in accordance with the ethical principles outlined in the tenets of the Declaration of Helsinki and was compliant with the U.S. Health Insurance Portability and Accountability Act. Using Current Procedural Terminology codes 66840 (removal of lens fragment using irrigation and aspiration) and 66850 (removal of lens fragment using phacofragmentation), the medical records of all patients at UAMS' Jones Eye Institute who were diagnosed with a retained nuclear fragment after cataract surgery between January 2006 and January 2018 were retrospectively reviewed. The charts were further narrowed down to include only patients with retained nuclear fragments in the anterior chamber after uneventful phacoemulsification. Patients with a history of complicated surgery, posterior capsule rupture, trauma, retinal detachment, or vitreous hemorrhage were excluded.

Patient demographic information, preoperative A-scan results, preoperative and postoperative visual acuities, and examination findings were reviewed. The time between the diagnosis of a retained fragment until removal was recorded, surgical outcomes were noted, and patients' medication records were reviewed.

RESULTS

The review identified 19 patients with retained nuclear fragments in the anterior chamber with an intact posterior capsule after uneventful phacoemulsification. During the same period, 4367 cataract surgeries were performed at the institute, making the incidence 0.44%. The mean age of the 15 women and 4 men was 72.68 years (range 67 to 79 years).

Table 1 shows the preoperative clinical findings. Eleven patients were white. Preoperative refractions were available for 18 patients, with 77.8% of them being myopic (preoperative refraction ranging from −0.25 to −8.0 diopters [D]). The preoperative corrected distance visual acuity (CDVA) ranged from 20/20 to counting fingers (CF) at 4 feet. Seven patients (36.8%) required trypan blue during cataract surgery. Patient 12 and patient 15 required mechanical dilation because of an intraoperative floppy iris and posterior synechialysis, respectively. Five patients, all African American, had a dense peripheral arcus noted in their medical charts. The mean AL was 23.58 mm; the AL was less than 22.0 mm in 5.26% of patients, between 22.0 mm and 24.0 mm in 63.16%, and greater than 24.0 mm in 31.58% (Figure 1). The mean keratometry (K) reading in all 19 patients was 44.62 D. The surgical history of patient 1 showed previous radial keratotomy, which artificially flattened the cornea. When that patient was excluded from the mean K calculation, the mean was 44.93 D. Preoperative anterior chamber depth (ACD) values were available for 18 patients. In these patients, the mean ACD was 2.97 mm. The mean intraocular lens (IOL) power was 20.55 D.

Table 2 shows the clinical examination findings when patients were initially diagnosed with a retained fragment. Patients presented with a CDVA ranging from 20/20 to CF at 3 feet. Of the 19 patients, 63.2% had retained nuclear fragments in the right eye and 36.8% in the left eye. The retained fragments were located in the inferior angle of the anterior chamber in 89.5% of patients. Patient 6 had a fragment located behind the IOL, and the particle fragment location was not noted in the clinical records for patient 7. At the time of the diagnosis, the mean intraocular pressure (IOP) was 16.85 mm Hg (range 11 to 25 mm Hg). In cases for which data were available, 52.6% of patients presented with corneal edema and 72.2% had anterior chamber inflammation. Most of the patients were diagnosed on slitlamp examination, with only 1 patient requiring gonioscopy to identify the lens fragment.

Table 3 shows the time that between each patient's cataract extraction and the diagnosis of retained fragment as well as the time from the diagnosis until surgical removal of the fragment. Visual outcomes and complications after surgical removal of the retained fragment at 2-week, 3-month, and 6-month follow-up appointments are shown. Patient 1 had 2 retained fragments in the right eye that were diagnosed and treated as separate events. Thus, the time to diagnosis and time to removal after diagnosis has been recorded as individual events, which is reflected in the reported mean values. In addition, the retained fragment in patient 18 resolved with the use drops and surgical intervention was not required after the diagnosis. The mean time between cataract extraction to the diagnosis of a retained nuclear fragment was 24.4 days (range 1 to 148 days) (n = 20). The mean number of days between identification of the retained fragment and a corrective surgical procedure was 9.58 days (range 1 to 49 days) (n = 19). Overall, the mean time from cataract surgery to lens fragment removal was 34.68 days (range 1 to 197 days) (n = 19).

The 18 patients who required surgical intervention of their retained fragment were divided into 2 groups based on whether they received early (within 8 days of diagnosis) or late (more than 8 days after diagnosis) surgical treatment. Of the patients, 72.2% had surgical treatment that involved irrigation/aspiration (I/A) removal of the retained fragment within 8 days of the diagnosis. Patient 6 was lost to follow-up; thus, the visual outcomes after fragment removal were not available. Of the 12 patients with follow-up data, the mean time from diagnosis to surgical intervention was 4.8 days and the final CDVA ranged from 20/20 to 20/200. Of these patients,