Implantation Cyst of Anterior Chamber: A Case Report

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Abstract
This clinical case report describes a single case of a progressively enlarging anterior chamber cyst arising in a patient with prior cataract surgery. We detail findings of a large implantation cyst within the anterior chamber, confirmed on ultrasound biomicroscopy. The patient was successfully treated with needle aspiration and injection of 5-fluorouracil without recurrence at 5 months. Anterior chamber cysts are a rare side effect of cataract surgery caused by intrusion of epithelial cells during surgery. Patients may present with a progressively enlarging mass requiring surgical intervention. Aspiration and injection of a cytodestructive chemical agent is one conservative approach in the management of an implantation cyst, with our patient exhibiting favorable visual outcomes.

Introduction
Anterior segment cystic lesions may be classified as primary or secondary [1, 2]. Primary cysts are of neuroepithelial versus iris stromal origin, and secondary cysts occur as the result of implantation, metastatic or parasitic lesions, or after chronic miotic use [1]. The purpose of this case report is to describe findings of a patient with a large serous implantation cyst 2 years after uncomplicated cataract surgery and discuss treatment and visual prognosis.
Case Report

The patient is a 61-year-old female with a history of CNS hemangioblastoma and hypertension who presented to the ophthalmology clinic with cloudy vision in her left eye for 2 weeks and associated 3/10 pain. She also noticed that her left pupil was larger than the right. The patient denied mechanical trauma to the eyes. Ocular history was significant for uncomplicated bilateral phacoemulsification with posterior chamber intraocular lens insertion 2 years prior and no other eye surgery.

Examination

The patient’s uncorrected visual acuity was 20/20 in the right eye and 20/60 in the left eye pinholing to 20/30. Her left pupil appeared dilated and was reactive without a relative afferent pupillary defect. Intraocular pressures were 16 and 14 mm Hg in the right and left eyes, respectively. Slit lamp examination demonstrated a large implantation cyst in the anterior chamber protruding through the pupil centrally and temporally with corneal touch (shown in Fig. 1). The iris was irregular and dilated. Fundus examination was unremarkable; however, retroillumination displayed cystic contents. Posterior segment B-scan demonstrated a normal posterior segment. Anterior segment B-scan ultrasound biomicroscopy (shown in Fig. 2) revealed a 4 × 5 mm implantation cyst within the anterior chamber, normal ciliary body, and no mass lesion.

Clinical Course

Because the cyst involved the patient’s visual axis, there was a discussion with the patient regarding surgical intervention. Given the potential risk of seeding the entire anterior segment with epithelium with cyst excision, the patient opted for drainage and antimetabolite injection.
first. The patient underwent anterior chamber cyst drainage and injection of 5-fluorouracil (5-FU) in the left anterior chamber in the operating room under topical anesthesia. A 27-gauge needle connected to a 3-way stopcock was inserted into the cyst through the temporal cornea. The cyst was aspirated. The needle was left in the eye, and the stopcock was opened so that 5-FU could be injected into the cyst. 0.2 mL of 500 μg/0.1 mL concentration of 5-FU was injected, which partially refilled the cyst. The needle was then removed, leaving the 5-FU instilled in the cyst. Ofloxacin and prednisolone drops were prescribed for use in the left eye four times a day for 1 week and then tapered. For a 1-min video of the procedure, please see https://zenodo.org/record/6783096.

One week post-drainage and injection, the left anterior chamber exhibited significantly reduced cyst size with faint central haze or cyst remnant (shown in Fig. 3). The iris remained slightly irregular. The patient reported improved vision with slight blurring on temporal gaze. Her uncorrected visual acuity returned to her baseline of 20/25. At the 5-week and 5-month postoperative visits, visual acuity remained 20/25 and exam revealed a stable remnant cyst.

The drained specimen was sent to pathology to assess for corneal versus iris choroidal epithelial cell in aspirate fluid. Fluid cytology revealed uncharacterized cyst contents consisting of an amorphous, nonkeratinized, eosinophilic staining material. No epithelium or cellular elements were noted.

**Discussion**

The pathogenesis of epithelial cysts involves displacement of surface epithelial cells with subsequent proliferation of these cells to form a cyst that is outlined by squamous epithelium [3]. Implantation of epithelial surface cells from the cornea, conjunctiva, or skin may occur by entrance of these cells into the eye during surgical or perforating trauma [1, 4–6]. Normal aqueous humor has been shown to have an inhibitory effect on the growth of these cells, but the iris provides an adequate environment for cell proliferation [7].

The subtypes of epithelial implantation are solid mass, sheet-like, and serous, or fluid-filled cysts [8]. The term serous is used to describe fluid-filled epithelial implantation. Few reports of serous implantation cysts exist in the literature. Marigo et al. [9] reported a similar case of implantation cyst occurring in the posterior chamber secondary to cataract surgery 2 years prior and an incidence of post-traumatic anterior chamber serous cyst that was adherent to the corneal endothelium and anterior lens surface. Left untreated, such serous cysts may erode through the iris and invade the posterior chamber [5]. These cysts may be imaged by ultrasound biomicroscopy, showing encapsulated round or elliptic lesions with a sonolucent cavity [10].
Echolucent cysts are always unilateral and are usually located in the iris or ciliary body stroma. They tend to have large diameters that cause iris atrophy by compression, as seen in this case [11]. In a retrospective chart review, Marigo et al. [9] reported that most cystic lesions were not septate. Histopathologic study demonstrated that cyst walls consisted of nonkeratinized squamous stratified epithelial cell lining and that their sonolucent cavities were filled with fluid and degenerated epithelial cells.

Though cystic forms of implantation are less common than epithelial downgrowth, they are considered less challenging to manage due to prompt detection and surgical eradication [12, 13]. Close observation for signs of progression may suffice for small and stable cysts, while larger cysts require surgical management [13]. Larger cysts can grow in size and cause pupillary block and secondary glaucoma, uveitis, corneal decompensation, and, eventually, a painful, blind eye [5, 14, 15].

Many different modalities of treatment, ranging from minimally invasive techniques like aspiration of the cyst and laser therapy, to aggressive surgical procedures like in toto surgical excision have been described for the management of anterior chamber cysts [16]. Less invasive successful treatment options for the management of anterior chamber implantation cysts have included aspiration of cyst contents and intralenteal administration of mitomycin C. Conservative approaches include aspiration with or without cauteryization, diathermy or iridectomy, injection of sclerosing agents, electrocautery, and photoagulation [5, 14, 15, 17]. Xenon arc photocoagulation or argon endolaser photocoagulation of the residual cyst wall following aspiration has been employed [18–23]. Aspiration of the cyst alone has been reported to have a high rate of recurrence [24]. Laser treatment with Nd-YAG laser to rupture the cyst has resulted in poor outcomes with violent postoperative inflammatory reaction and high recurrence rates [25, 26]. Additionally, producing a hole in the wall of an epithelial cyst may externalize it, thereby converting it into a sheet-like epithelial ingrowth, which carries a less favorable visual prognosis [9]. Multiple treatments may be required, and despite treatment, recurrences are frequent.

More invasive methods such as vitrectomy and local cryoablation of adjacent cyst wall have also been described [13]. Extensive surgical procedures are aimed at aggressive surgical excision and devitalization of the epithelial tissues. These include procedures such as complete block excision of all epithelial layers and adjacent cornea, iris, anterior chamber angle, and ciliary body with cryodestruction of residual cells at the excision site [14, 27]. However, while generally successful in eradicating the epithelial tissue, these procedures increase the possibility of significant collateral damage to adjacent ocular structures with resultant poor functional outcome [13].

As noted by Rishi et al. [28], the challenge in the surgical management of anterior chamber cyst is to identify the complete extent of the epithelial downgrowth and to ensure the removal of the cyst in full. As mentioned earlier, if the cyst is ruptured or part of the cyst wall is left behind, there is a high chance of recurrence or a postoperative inflammatory reaction. Conversely, aggressive surgical procedures aimed at complete eradication of the proliferative epithelial tissue are likely to produce significant collateral damage to the adjacent ocular structures, which in turn would result in a poor functional outcome [16]. The basic principle in the surgical management of secondary anterior chamber cysts seems to be removal of proliferative epithelial tissue that constitutes the cyst wall, via surgical excision or injection of cytoreductive agents, while minimizing collateral tissue damage [16]. The clinician must weigh the options of total excision with higher likelihood of complications against a more conservative approach of aspiration with higher chance of recurrence.

Our patient had a large anterior chamber cyst of unknown origin with associated iris compression. Fluid cytology was unable to discriminate between iris, choroidal, or corneal epithelial origin. Although primary iris cyst is possible, the clinical picture is most consistent with an epithelial implantation cyst that resulted secondary to cataract extraction, which may
have introduced epithelial cells into the anterior chamber [4, 6]. The large diameter of the cyst resulted in obstruction of the patient’s visual axis. We opted for an initial conservative approach including aspiration of cyst contents and injection of 5-FU based on prior case reports supporting the intracameral tolerability of 5-FU [29, 30]. In this case, 5-FU, an antimetabolite inhibitor of thymidylate synthase that decreases the proliferation of locally infiltrating fibroblasts, was introduced with the intent of cytodestruction and reduction of scarring. The patient’s postoperative period was uneventful, visual outcome was favorable, and there was no significant inflammatory reaction associated with the procedure. Lack of follow-up beyond the 5-month period is a limitation of this case report.

**Conclusions**

In summary, serous implantation cyst is an exceedingly rare complication of modern cataract surgery caused by introduction of epithelial cells into the anterior chamber during surgery. This case demonstrates that, in addition to the previously described solid pearl and sheet-like growth forms, epithelial implantation may also present as a serous cyst. Clinicians should have a high index of suspicion for this condition in pseudophakic patients and follow-up with ultrasound biomicroscopy. Appropriate conservative treatment includes early aspiration with injection of cytodestructive chemical agents, which may be associated with a more favorable visual prognosis.

**Statement of Ethics**

Ethical approval is not required for this study in accordance with local or national guidelines. This research complies with ethical guidelines for human studies in accordance with the World Medical Association Declaration of Helsinki. Written informed consent was obtained from the patient for publication of the details of their medical case and any accompanying images.

**Conflict of Interests Statement**

The following authors have no financial disclosures: Esteban Peralta, Tyler Etheridge, Roger Harrie, and Amy Lin.

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**Author Contributions**

The authors attest that they meet the current ICMJE criteria for authorship. Author contributions are as follows: Esteban Peralta drafted, revised, and approved the manuscript. Tyler Etheridge revised and approved the manuscript. Roger Harrie acquired images and approved the manuscript. Amy Lin treated the patient, documented outcomes, revised the work, and provided final approval of the manuscript. Authors are to be listed in the following order: Esteban Peralta, Tyler Etheridge, Roger Harrie, and Amy Lin.
Data Availability Statement
All data that support the findings of this study are included in this article. Further inquiries may be directed to the corresponding author.

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