Fungal Infection of Sutureless Self-sealing Incision for Cataract Surgery

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**Purpose:** To report the clinical picture and outcome of fungal infection of self-sealing wounds in cataract surgery.

**Design:** Retrospective noncomparative case series.

**Participants:** Seven postoperative cataract patients.

**Methods:** Seven consecutive patients who underwent cataract surgery in different locations in India and developed microbiologically proven fungal infection of the surgical wound were included. All were managed at a tertiary eye care center in India between May 2001 and April 2002.

**Main Outcome Measures:** The data reviewed included patient age, gender, onset of symptoms after surgery, examination findings at the time of onset of symptoms and referral, laboratory workup, treatment, and outcome. The cataract surgeons involved were contacted to determine their cataract practice and to determine any possible breach in the sterile technique.

**Results:** The median interval to onset of symptoms after cataract surgery was 5.0 days (mean, 5.8 days; range, 3–9 days). The initial diagnoses at the time of onset of symptoms were keratitis (n = 11005), scleritis (n = 1), and excessive anterior chamber reaction (n = 11005). The last 4 patients were treated with topical and/or systemic corticosteroid therapy before referral. All cases subsequently developed deep keratitis. Specimens for microbiology workup were obtained by scrapings (n = 6), corneoscleral biopsy (n = 4), and anterior chamber paracentesis (n = 4). Organisms identified were Aspergillus flavus (n = 2), Aspergillus terreus (n = 2), Aspergillus spp. (n = 2), and Candida albicans (n = 1). The infection resolved with medical therapy in 2 cases; the final visual acuity was 20/125 in one case and 20/20 in the other case. The infection progressed to endophthalmitis in 5 eyes, resulting in complete loss of vision. The source of infection could not be identified in any case.


Infectious complications after cataract surgery pose a serious threat to vision. Although the literature contains several reports on postoperative endophthalmitis, there are very few published data on corneoscleral wound infection. A poorly constructed wound, loose or broken sutures, and associated dacryocystitis have been identified as important predisposing conditions for wound infection in these reports.1–7

Most of the available literature addresses issues related to infections after conventional extracapsular cataract extraction; there is little information related to sutureless self-sealing wound infections.2,7,8 Further, these reports mainly discuss bacterial infection, with no information on fungal infection. We report a series of patients with fungal infection of the sutureless self-sealing wound to describe the clinical appearance, possible predisposing factors, and difficulties in diagnosis and management of such cases.

**Materials and Methods**

This is a retrospective case series comprising 7 consecutive cases of fungal infection of self-sealing tunnel incision for cataract surgery examined between May 2001 and April 2002 at the L. V. Prasad Eye Institute, India. The cases were identified from the prospectively collected corneal ulcer database of the L. V. Prasad Eye Institute. Patient demography, history, clinical features, microbiology, treatment, and outcome of every case of microbial keratitis are entered in this database. We reviewed the medical records of patients who had cataract wound infection. The cases that had microbiologically proven fungal infection of self-sealing sutureless wounds were included in this study. The diagnostic criteria in these cases were the presence of infiltrate along the sutureless tunnel incision, i.e., external wound, tunnel, or internal wound, with or without infiltrates in the surrounding stroma and anterior chamber reaction. Patients with infection of sutured cataract wounds and those with infection caused by nonfungal etiology were excluded.

We collected information regarding the age and gender of the individuals, type of incision and cataract surgery, postoperative treatment, onset of symptoms after surgery, and possible risk factors. Published by Elsevier Inc.
factors for infection. We performed a detailed clinical examination, including slit-lamp biomicroscopy and B-scan ultrasonography, at the time of presentation and at each subsequent visit. We paid special attention to the wound, adjoining sclera, size and depth of the infiltrate, and anterior chamber reaction. In addition, Seidel’s test and irrigation of the lacrimal drainage system were performed in all cases to rule out wound leak and dacryocystitis, respectively.

All patients were subjected to a detailed microbiology workup. Specimens were collected through corneal or scleral scraping by using a no. 15 surgical blade, corneal or scleral biopsy, and anterior chamber paracentesis. The material was examined microscopically by using Gram stain, Giemsa stain, and potassium hydroxide/calcofluor-white preparation and inoculated on various culture media that facilitate the growth of fungi, bacteria, and parasites (blood agar, chocolate agar, Sabouraud’s dextrose agar, potato dextrose agar, non-nutrient agar, thioglycolate broth, and brain heart infusion broth). The diagnostic criteria considered in these cases have been described in a previous publication and included (1) fungal elements on smear examination, (2) fungal growth on more than one medium in the absence of fungal elements in smear, and (3) fungal growth on one medium in the presence of fungal elements in smear.9 Fungal identification was based on spore morphology.

The initial treatment was based on the smear results and was subsequently modified after the culture report. In addition, whenever possible, the cataract surgeons involved were asked about their cataract practice to determine the possibility of a breach in the aseptic techniques.

Results

Between May 2001 and April 2002, 31 cases of cataract wound infection and 174 cases of postoperative endophthalmitis were examined at the L. V. Prasad Eye Institute. Of these, 22 had infection of a sutured extracapsular cataract incision, and 9 had infection of a sutureless self-sealing tunnel incision; fungi were isolated in 7 of these cases. There were 3 female and 4 male patients. Patients ranged in age from 68 to 80 years. The symptoms started 3 to 9 days after cataract surgery. Six patients had diabetes mellitus; however, the blood sugar was under control (fasting blood sugar, 110–140 mg%) at the time of examination at our center in all except one case (fasting blood sugar, 320 mg%).

The clinical features of our patients are shown in Table 1. The cataract incision was located superiorly in all cases except one (case 2), which had a temporal incision. The incision started in the sclera in 5 cases and at the surgical limbus in 2 cases (cases 2 and 4). Two patients (cases 3 and 7) had manual (nonphacoemulsification) cataract extraction. The surgery was uneventful, and all patients had good visual recovery on the first postoperative day. The immediate postoperative management by the referring surgeons consisted of topical prednisolone acetate 1% and topical antibiotic.

After the onset of symptoms, 3 patients were diagnosed as having microbial keratitis (cases 2, 4, and 7), 3 as having increased anterior chamber reaction (cases 1, 3, and 6), and 1 as having scleritis (case 5). The last 4 cases (diagnosed as scleritis and excessive postoperative reaction) were therefore treated with intensive topical corticosteroids before the infectious etiology was suspected. At the time of presentation to us, all cases showed frank corneal involvement, with the clinical pictures shown in Figure 1. The infiltrate was denser and reached full thickness near the wound and was midstromal in the remaining cornea. Seidel’s test was negative in all cases, and the nasolacrimal duct was patent. B-scan ultrasonography at presentation revealed an echo-free vitreous cavity in all cases.

The technique initially used to obtain the specimen was scraping in 6 cases and corneal biopsy with anterior chamber paracentesis in 1 case (case 4; in this case, the infiltrates were absent in the superficial cornea). In 3 patients (cases 1, 2, and 3), scrapings from the corneal surface overlying the infiltrate did not reveal any organisms on microscopy or culture, and, hence, corneoscleral biopsy and anterior chamber paracentesis were performed in these cases. All 7 cases showed a significant growth of fungi, which were identified as Aspergillus flavus (n = 2), Aspergillus terreus (n = 2), Aspergillus spp. (n = 2), and Candida albicans (n = 1).

We treated all patients who had filamentous fungal infection with topical natamycin 5% every 30 minutes and atropine sulfate 1% 3 times a day in addition to oral ketoconazole 400 mg/day (n = 4) or itraconazole 200 mg/day (n = 2). One patient (case 4), who had a yeast infection, received topical fluconazole 2% and amphotericin B 0.05% every half-hour and oral fluconazole 200 mg twice daily. The infection resolved (Fig 2) with medical treatment in 2 cases (cases 4 and 5) and progressed to endophthalmitis in 5 cases (Table 1). The mean duration of the medical treatment in cases with resolved infiltrates was 8 weeks; the best-corrected visual acuity was 20/125 in one (case 4) and 20/20 in the other case (case 5). All the cases that worsened with medical treatment were advised penetrating keratoplasty with possible ex-
placation of the intraocular lens, vitrectomy, and intravitreal injection of amphotericin B. However, all patients except one (case 1) refused surgery. Even this patient developed recurrence of infection associated with endophthalmitis and secondary glaucoma after surgery (Fig 3). Ultimately, all these eyes became phthisical.

We contacted the surgeons who had operated on these patients and tried to obtain information on their cataract surgery practice to find a possible cause of infection. All of them had been in practice for >5 years and performed an average 50 surgeries per month. They all denied the possibility of breach in the aseptic technique. Two surgeons had performed phacoemulsification with the patient under topical anesthesia and used a diamond knife for wound construction, whereas the others had performed surgery with the patient under peribulbar block and used metal blades for wound construction. All admitted to reusing blades; the sterilizing technique was overnight exposure to formalin vapors in a formalin chamber or activated glutaraldehyde 2.45% solution (Cidex; Johnson & Johnson, New Brunswick, NJ). All surgeons denied the presence of infection in other patients operated on the same day.

Discussion

Over the last decade, a number of advances have occurred in cataract surgery: one of the most important is the development of the self-sealing sutureless wound. The wound consists of an external incision, an internal incision, and a tunnel joining these 2 incisions. The tunnel varies in length depending on the location and size of the incision. When the anterior chamber is formed, the internal corneal lip closes the wound and prevents egress of fluid from the chamber. However, this wound architecture may leave a potential space if both the roof and floor of the tunnel are not in tight apposition; such a space can lead to the formation of an abscess cavity in the event of infection. This may alter the clinical picture, course of the disease, and outcome compared with infection of the conventional cataract surgery wound.

In this series, the initial clinical picture at the onset of symptoms ranged from scleritis to excessive postoperative reaction to keratitis. To explain the varied presentation, we hypothesize that the initial presentation in sutureless wound infection depends on the site of incision and the location of infection within the tunnel. In a scleral tunnel incision, the infection, located primarily at the external incision, may manifest as scleritis (case 5), whereas an infection located at

Figure 1. Different clinical presentations in fungal infection of self-sealing sutureless wounds for cataract surgery. A, Presentation as scleritis in a scleral tunnel incision (case 5). Note the presence of infiltrate at the internal incision and the relatively clear cornea (insert). B, Presentation as keratitis in a case with a clear corneal temporal incision (case 2).

Figure 2. A case (case 5) of fungal infection of the scleral tunnel incision that resolved with antifungal therapy and surgical debridement. Note the scleral thinning around the external incision (arrow).

Figure 3. A case (case 1) of worsening fungal infection of the superior scleral tunnel incision. A, Clinical picture at presentation. B, Worsening infection. The infection recurred after penetrating keratoplasty and progressed to endophthalmitis (C, D).
an internal incision may manifest as keratitis. Infection of a clear corneal incision will primarily manifest as keratitis (cases 2 and 4) irrespective of its location within the tunnel. Although the initial clinical picture in our series of fungal infection supports this hypothesis, further evaluation is needed before we can say whether it applies to bacterial infections.

This variation in clinical presentation poses a diagnostic challenge, particularly in patients with an infection of the scleral tunnel incision. In our series, 3 cases were diagnosed and managed as postoperative reaction and 1 as surgically induced necrotizing scleritis; these patients received corticosteroid therapy before the infectious etiology was suspected. The diagnostic dilemma is further compounded by the possibility of failing to identify a microorganism on routine microbiology workup, as seen in cases 1, 2, and 3 in our series. A strong clinical suspicion, coupled with corneoscleral biopsy, scrapings from the base of the biopsy site, and anterior chamber paracentesis can allow diagnosis of cases with deep-seated infiltrate.

Fungal infection of the tunnel incision also presents a therapeutic challenge because (1) most of the available antifungal agents are fungistatic and have poor penetration into the deep stroma, (2) use of corticosteroids before the onset of clinical signs of infection may cause the infecting organisms to spread diffusely, and (3) the microorganisms may gain early access to the anterior chamber and vitreous cavity, giving rise to endophthalmitis. Surgical treatment can also be challenging because of the proximity to the limbus and the high risk of recurrence of infection from persistence of fungi on the scleral side of the wound and intraocular extension. In this series, the infection was controlled with medical management in 2 of 7 eyes; 5 patients ultimately developed endophthalmitis. One patient who had penetrating keratoplasty developed recurrence of infection. Valenton described 7 cases of fungal infection of extracapsular cataract surgery wound in which 6 eyes were lost. In contrast, in the series of Mendicute et al., infection resolved in 6 cases, and evisceration was required in 2.

Because this entity poses both a diagnostic and therapeutic challenge and because the frequency of fungal eye diseases is highly variable around the world, it is important to consider it in differential diagnosis in geographic areas with a hot and humid climate, such as the tropics and subtropics. These areas have a relatively high prevalence of fungal infection. At the L. V. Prasad Eye Institute, fungi were isolated from 1360 (38.2%) of 3563 culture-positive corneal ulcer cases examined from February 1991 to June 2001 (Garg et al, unpublished data). Similarly, fungal isolates accounted for 16.7% cases of culture-positive postoperative endophthalmitis.

The sources of microorganisms in self-sealing wound infections are not known but may be similar to those of conventional wound infection and endophthalmitis. Sources of infection described in the literature include the patient’s own eyelids and conjunctiva, contaminated instruments, lenses or irrigating solutions, airborne infections, and breaches in the sterile technique. In the study on corneoscleral wound infections by Valenton, predisposing factors were an obstructed nasolacrimal duct, airborne contamination of the wound, and defective sterilization of instruments. Cosar et al., however, could not identify any of these factors and suspected the use of corticosteroids without antibiotics as an important predisposing factor in their series. We could not prove any specific source of infection in this series, but the possibility of contamination of surgical instruments, infected conjunctival sac, and airborne infection cannot be ruled out. A culture of the conjunctival sac of the uninvolved eye (which we did not perform) could have provided clues about the microbial flora (Alfonso E, personal communication, 2002).

As identified in some endophthalmitis series, diabetest mellitus (6 of 7 patients) might have been an important predisposing or aggravating factor in this series. However, it was the patients whose infections resolved who had medically controlled diabetes mellitus. To evaluate its role further, we analyzed 34 cases of fungal infection after extracapsular cataract extraction. Thirteen (38.2%) cases had diabetes mellitus in that series (Garg et al, unpublished data). Therefore, we believe that diabetes mellitus may be an important predisposing factor for fungal infection of cataract wounds. However, this requires further evaluation.

Fungal infection of the self-sealing tunnel incision can pose a diagnostic and therapeutic challenge. To facilitate early diagnosis, this should be considered in the differential diagnosis of cases presenting as scleritis or with excessive postoperative reaction after cataract surgery in geographic areas with a hot and humid climate. Because the infection is deep seated, corneal biopsy and anterior chamber paracentesis may be used in cases in which the routine initial microbiologic evaluation yields a negative result.

References

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