Preventing Post-LASIK Keratitis

Antibiotic prophylaxis in refractive surgery.

BY ERIC D. DONNENFELD, MD

LASIK is the most frequently performed surgical procedure to correct refractive errors and is the most common elective surgery in the US. When compared with other refractive procedures, LASIK preserves the integrity of Bowman's membrane and the overlying epithelium, thus decreasing the risk of microbial keratitis. Nevertheless, this pathologic condition does occur after LASIK and has become an increasingly recognized sight-threatening complication.[1-8]

THE PREVALENCE OF INFECTIOUS KERATITIS

The Conclusions of Studies

The incidence of post-LASIK infectious keratitis is unknown and varies widely depending on the study. One large, retrospective investigation of the complications associated with LASIK surgery found an incidence of two infections in 1,062 eyes,[6] and a similar study found one infection in 1,019 eyes.[8] Recently, however, a case series of LASIK-associated infections encountered at a single institution quoted an estimated occurrence of between 1:1000 and 1:5000.[7] Based on a comprehensive review and analysis of the published literature, Chang and colleagues[4] confirmed that the incidence of post-LASIK infections can vary widely (0% to1.5%).

Infectious Keratitis: Survey Results

The ASCRS' Cornea Clinical Committee developed a survey on post-LASIK infectious keratitis and questioned its members in 2001 and again in 2004.[8] According to the 2001 survey, the rate of infectious keratitis was one per 2,919 procedures performed (116 post-LASIK infections were reported by 56 LASIK surgeons who had performed an estimated 338,550 procedures). The results of the 2004 survey indicated that one infection occurred per every 2,131 procedures performed. I believe the increase in rates of infection is due to an upsurge in gram-positive resistant organisms such as methicillin-resistant *Staphylococcus aureus*. Culturing results revealed opportunistic infections and gram-positive bacteria as the most common organisms in 2001 (Figure 1A). In 2004, gram-positive bacteria increased in incidence although opportunistic infections, specifically atypical mycobacteria, decreased markedly (Figure 1B). In 2004, the epidemic of atypical mycobacteria decreased from that seen in 2001 (Figure 1A) from an incidence of 48% to 5%. I presume this decline is due to the use of fourth-generation fluoroquinolones and an improved sterile technique. It is interesting to note that no surgeon in the 2004 survey reported a patient who received a fourth-generation fluoroquinolone prophylactically and developed atypical mycobacterial infectious keratitis. The overall incidence of this condition, however, was higher in 2004 than 2001.

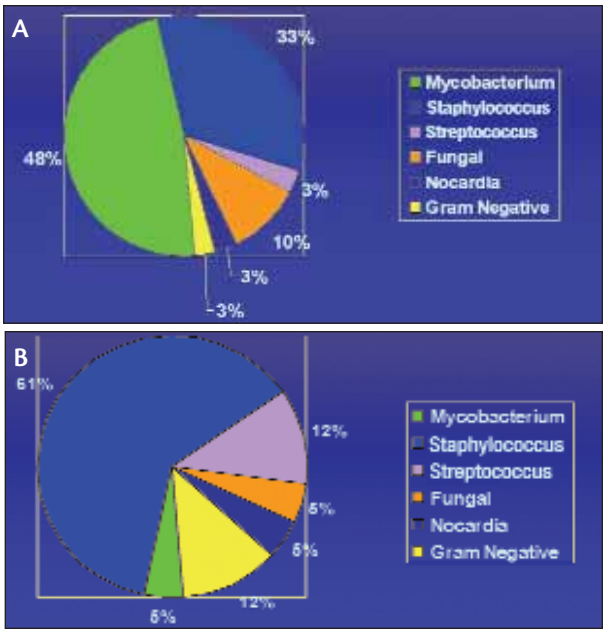

Figure 1. The ASCRS 2001 (A) and 2004 (B) survey culture results of post-LASIK infectious keratitis are shown.

PRE-, INTRA-, AND POST-LASIK PROPHYLAXIS

Surgery

The findings from the aforementioned surveys and an analysis of the data trends can assist with the prophylaxis against and treatment of infectious keratitis following

LASIK. A high degree of suspicion, coupled with a rapid diagnosis and appropriate therapy, can result in visual recovery. For prophylaxis against post-LASIK infectious keratitis, surgeons need to implement several steps. Preoperatively, all patients considering refractive surgery should have a thorough examination of their eyelids and lacrimal apparatus. Treating infectious lid disease prior to LASIK with hot compresses and a topical antibiotic ointment applied three times daily to the lid margin may decrease the risk of a bacterial keratitis.

A small minority of clinicians recommend that refractive surgeons perform monocular surgery or use separate instruments when performing bilateral surgery.[9] Some ophthalmologists suggest the use of sterile drapes, gowns, gloves, and masks by the treating physician and assisting technician. A 10% betadine solution applied to the eyelids prior to cataract surgery has been shown to decrease the incidence of endophthalmitis postoperatively, and this technique is recommended by many clinicians for LASIK.[10] Proper methods of sterilization can prevent the use of contaminated instruments. Because several epidemics of atypical mycobacteria have been associated with the use of nonsterile water to clean instruments or the use of ice during LASIK surgery, all fluids applied to the eye before, during, and after LASIK should be disinfected.[11]

Antibiotics

Antibiotic prophylaxis for LASIK should provide a broad-based spectrum of coverage with an emphasis on gram-positive organisms. Ophthalmologists should choose a nontoxic antibiotic to promote epithelial healing and provide coverage against atypical mycobacteria. Finally, the appropriate antibiotic will penetrate effectively into the cornea and achieve therapeutic levels in the middle stroma. Fourth-generation fluoroquinolones (gatifloxacin 0.3% and moxifloxacin 0.5%) for the antibiotic prophylaxis against infection following LASIK and PRK are recommended, because they are best suited to meet the aforementioned criteria.[11] My colleagues and I begin topical therapy 1 hour prior to surgery, and, at the conclusion of LASIK, we dehydrate the cornea for 1 to 2 minutes to improve the flap's adherence. Next, we apply the antibiotic directly to the dehydrated flap to improve drug absorption into the cornea. With PRK, we place the antibiotic directly onto the stromal bed and soak the bandage contact lens in the antibiotic for 30 seconds prior to placing it on the eye. Postoperatively, LASIK patients receive a fourth-generation fluoroquinolone q.i.d. for 5 days, whereas PRK patients commence this regimen 1 day after their epithelial defect has closed.

CONCLUSION

Culturing results reveal gram-positive bacteria as the most common organisms behind the increased incidence of infectious keratitis. This complication may present as late as several months following LASIK, and its frequent misdiagnosis at initial presentation may result in significant vision loss.[11] Surgeons should therefore have a high degree of suspicion with elevated flaps, and they should culture all eyes in which they suspect infectious keratitis following LASIK. Most organisms are opportunistic and do not respond to conventional therapy. For the treatment of rapid-onset and delayed-onset infectious keratitis, the recommendation is to elevate the flap and irrigate the flap interface with an appropriate antibiotic solution (fortified vancomycin 50 mg/mL for rapid-onset keratitis and fortified amikacin 35 mg/mL for delayed-onset keratitis). For rapid-onset keratitis, my colleagues and I recommend a fourth-generation topical fluoroquinolone such as gatifloxacin 0.3% or moxifloxacin 0.5% given in a loading dose every 5 minutes for three doses and then every 30 minutes alternating with an antimicrobial that is rapidly bacteriocidal and has increased activity against gram-positive organisms, such as fortified vancomycin 50mg/mL every 30 minutes.

For delayed-onset keratitis, which is commonly due to atypical mycobacteria, nocardia, and fungi, I recommend beginning therapy with amikacin 35 mg/mL every 30 minutes alternating with a fourth-generation fluoroquinolone (gatifloxacin 0.3% or moxifloxacin 0.5%) every 30 minutes, starting oral doxycycline 100mg twice a day, and discontinuing corticosteroids.[11] ■

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