The atypical, or nontuberculous, mycobacteria are opportunistic pathogens that usually cause infection following accidental trauma or surgery. These organisms are ubiquitous in nature but have been found with increasing frequency in other environments that include medical offices and surgical suites. Management of atypical mycobacterial ocular infections can be difficult because in vitro antibiotic activity does not always correlate with in vivo efficacy and because normal immune defenses against mycobacteria may work too slowly to prevent irreversible damage to infected ocular tissues. This report describes a patient who developed a severe ocular infection due to *Mycobacterium chelonae* after vitrectomy. Despite eradication of the infection, the eye became blind and painful.

**Arch Ophthalmol.** 2000;118:1125-1128

Atypical, or nontuberculous, mycobacteria are widely distributed in nature and have been generally regarded as acid-fast saprophytes. At least most atypical mycobacteria display low human pathogenicity, serious human infections have been associated with accidental and surgical trauma. This report describes a severe ocular infection caused by *Mycobacterium chelonae* that occurred after an uncomplicated vitrectomy.

**REPORT OF A CASE**

A 67-year-old man was referred for evaluation of a left idiopathic epiretinal membrane. Eight years earlier, the patient underwent a left cataract extraction with placement of a posterior chamber intraocular lens. He began treatment for open-angle glaucoma several years later with topical 2% pilocarpine hydrochloride and 0.5% timolol maleate in both eyes. Eight months earlier the patient was diagnosed as having a squamous cell carcinoma of the left upper eyelid and subsequently completed a course of external beam radiation (36 Gy; 20 sessions). One month after radiation treatment, a fibrinoid exudate developed along the left upper eyelid margin that was treated with oral prednisone and cephalaxin for several weeks. The left conjunctiva remained persistently red and irritated.

Over the next 6 months the patient was treated for this irritation with combinations of artificial tears, punctal plugs, topical corticosteroids, topical nonsteroidal anti-inflammatory medications, topical antibiotics, vitamin A ointment, oral doxycycline, and a bandage contact lens with improvement in comfort and decrease in left conjunctival hyperemia.

When the patient was referred for evaluation of his epiretinal membrane, corrected visual acuity was 20/25 OD and 20/60 OS. Vitrectomy with removal of the epiretinal membrane was performed without complication. A culture of the vitreous was obtained during surgery as part of a study to determine the rate of positive vitreous cultures in eyes without signs of inflammation or infection. Five days after surgery, 18 colonies of a rapidly growing mycobacterium were reported (later identified as *Mycobacterium chelonae*). Four weeks after surgery, the eye was mildly inflamed and there were focal lesions around the polyglactin 910 (Vicryl) sutures at the scleral vitrectomy ports. Conjunctival cultures yielded coagulase-negative *Staphy-*
lococcus and a rapidly growing mycobacterium (later identified as M chelonae). Several weeks later, the focal conjunctival lesions had enlarged (Figure 1). The specimen retrieved during biopsy of the conjunctiva at the superotemporal vitrectomy port was sent for culture and pathologic examination. The biopsy specimen showed large numbers of acid-fast organisms (see below); the culture was positive after 4 days for a rapidly growing species of mycobacterium (later identified as M chelonae).

Later that week, dural patch grafts were sewn into place over thinning sclera at the vitrectomy port sites. A Hessburg lavage was inserted through the upper eyelid and the eye was bathed continuously for 29 days with amikacin sulfate (50 mg/mL). The patient was also treated with intravenous amikacin (29 days), vancomycin hydrochloride (10 days), imipenem–cilastatin sodium (Primaxin) (28 days), oral ciprofloxacin hydrochloride (28 days), and oral clarithromycin (28 days). Intravenous morphine sulfate was used for pain. The 2 dural patch grafts melted and were replaced after several weeks. Conjunctival cultures taken during regrafting surgery, nearly 3 weeks after antibiotic therapy had been started, were negative for organisms. In vitro sensitivities from the first 2 culture yields were not available to guide initial therapy, but they eventually showed the organism sensitive to kanamycin, amikacin, and clarithromycin only. The patient was discharged from the hospital after 5 weeks on a regimen of topical amikacin sulfate (50 mg/mL), and oral ciprofloxacin and clarithromycin.

Following discharge from the hospital, ocular pain increased. Vision in the left eye declined to light perception; the eye was enucleated 15 weeks after vitrectomy.

The initial conjunctival biopsy specimen at the vitrectomy port site showed acute and chronic inflammation and focal granuloma formation (Figure 2). A large number of intracellular weakly acid-fast organisms were identified with the Ziehl-Neelsen stain (Figure 3). Conjunctival biopsy specimens taken when the initial scleral patch grafts were replaced showed mixed acute and chronic inflammation and granulation tissue. Only a few acid-fast organisms were identified with special stains.

The enucleated left eye had an opaque, white cornea and 2 large episcleral grafts held in place with monofilament suture from the 1- to 5-o’clock positions and the 7- to 10-o’clock positions. The cornea showed extensive stromal necrosis and chronic inflammation. The sclera over the ciliary body and anterior choroid was thin and in some foci less than one fifth the normal thickness. Ectatic sclera was covered by patch grafts. The graft-host interface contained chronic inflammatory cells and granulation tissue. Lymphocytes were present in the anterior chamber, trabecular meshwork, and uveal tract. An intraocular lens was present in the lens capsule with a small amount of re-

Figure 1. Left, A 3×6-mm scleral defect is present in the left eye between the 2- and 4-o’clock positions just posterior to the limbus at the site of a previous vitrectomy port. The area of scleral thinning is surrounded by intensely hyperemic conjunctiva and sclera. The cornea is transparent at this time. Right, A similar but more circular area of scleral thinning is present at the second vitrectomy port site at the 10-o’clock position. No discharge is present.

Figure 2. Results of a left conjunctival biopsy adjacent to the area of scleral thinning shows a mixture of chronic inflammatory cells. Numerous lymphocytes are dispersed among clusters of paler-staining epithelioid cells (asterisk) (hematoxylin-eosin, original magnification ×60).
The retina showed focal edema, a thin epiretinal membrane, and scattered small drusen in the posterior pole. The internal limiting membrane was intact and ganglion and nerve fiber layers of the retina were normal. Small numbers of acute and chronic inflammatory cells were found between the internal limiting membrane and posterior vitreous surface. Scattered lymphocytes were present in the pial septa of the optic nerve. Multiple sections of the globe were examined with special stains for acid-fast organisms and none were found.

The specimen from the left eyelid biopsy performed 3 months earlier (for which the patient received radiation therapy) was retrieved and showed an actinic keratosis. No acid-fast organisms were present.

E. H. Runyon as cited by Turner divided the nontuberculous mycobacteria into 4 groups based on their cultural characteristics and the development of pigmentation when exposed to light. *Mycobacterium chelonae* belongs to Runyon group IV, which is characterized by rapid growth, absence of yellow pigment and growth on MacConkey agar. *Mycobacterium fortuitum* and *M chelonae* (also known as *M fortuitum* complex) are the most important members of this group and are distinguished from one another by differences in the nitrate reductase test. Atypical mycobacteria of Runyon group IV usually cause mucocutaneous infection, typically after surgery or trauma. Primary skin or eye infection without a history of antecedent surgery or trauma is uncommon. Disseminated infection is rare in persons who are not immunocompromised.

Nontuberculous mycobacteria infections have been associated with several ophthalmologic procedures. Orbital and periocular infections have followed dacrocystorhinostomy and tear duct probing.

The cornea is the most common site of ocular infection. Mycobacterial keratitis has been reported following simple outpatient office procedures, radial keratotomy, pterygium removal, cataract extraction, contact lens use, refractive surgery, and keratoplasty. The primary source of infection is seldom found, although several epidemiologic investigations have implicated contaminated surgical instruments.

The primary source of the ocular infection in this patient was not determined. In all likelihood, however, the infection was acquired at the time of vitrectomy and involved an instrument or substance passing through the sclerotomy sites. Each of the 3 separate foci of conjunctival and scleral infection arose at sclerotomy sites and cultures taken from the vitreous effluent (as part of an unrelated research project) grew 18 colonies of an acid-fast organism within 5 days. No other mycobacterial infection had been reported from this operating room. Environmental cultures were never taken. To our knowledge, this is the first report describing mycobacterial scleritis and conjunctivitis following vitrectomy.

An alternative explanation for the origin of this infection is that the patient harbored mycobacterial organisms in his conjunctiva prior to vitrectomy. Radiation therapy, and perhaps other topical therapies, could have predisposed the conjunctiva to opportunistic infection or colonization by mycobacterial organisms. Although white and quiet at the time of vitrectomy, our patient’s conjunctiva, which was chronically inflamed for more than 6 months prior to surgery, cannot be discounted as the potential source of the infection.

The optimal therapy for nontuberculous mycobacterial infections is not known. Amikacin has been the single most frequently used antibiotic for atypical mycobacterial infection, but some patients fail to respond to topical therapy. Anecdotal experience with topical fluoroquinolones has been limited and the clinical impression of its effectiveness has been mixed. Some nontuberculous mycobacteria demonstrate in vitro resistance to ciprofloxacin. Topical ciprofloxacin may be more effective against *M fortuitum* than *M chelonae*. Animal models of atypical mycobacterial keratitis have shown that topical ciprofloxacin can effectively reduce the number of organisms and infiltrate size, but these findings are more consistently demonstrated for *M fortuitum* than *M chelonae*. Animal models have also suggested that multiple topical drugs do not improve effectiveness. Single-agent treatment, however, may be more likely to fail because of the development of drug resistance. In one series, clarithromycin had the best in vitro sensitivity profile against nontuberculous mycobacteria. In vitro sensitivity testing from our patient revealed resistance to all antibiotics except kanamycin, amikacin, and clarithromycin. Systemic antibiotics were used empirically be-
cause of scleral involvement, but there has been too little experience with the use of parenteral antibiotics in this setting to draw any conclusion about effectiveness.

One of the more perplexing aspects of this case was the progressive deterioration of the cornea during therapy. The cornea was initially uninvolved and became progressively opaque at a time when cultures and biopsy specimens from the conjunctiva indicated a favorable response to antibiotic therapy. The enucleated eye showed extensive corneal stromal necrosis and chronic inflammation, and no acid-fast organisms. The mechanism of cornea injury is unclear but could have been due to mycobacterial infection before eradication. Another possibility is that continuous amikacin laveage for 3 weeks caused toxic injury to the cornea.

Although most atypical mycobacteria are regarded as having low pathogenicity, they can cause serious opportunistic infections that are difficult to control. The growth of nontuberculous mycobacteria from an intraocular culture should not be regarded as an inconsequential contaminant, particularly if more than several colonies are recovered. 25

Accepted for publication July 20, 1999.

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REFERENCES


