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Antibiotic Resistance in Acute Postoperative Endophthalmitis

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Acute postoperative endophthalmitis (APE) is a serious, although infrequent, complication of eye surgery that can result in significant morbidity and costs. This review addresses APE risk factors, associated bacterial pathogens, antibiotic resistance, and prevention. *Ophthalmology 2014;121:S1-S9 © 2014 by the American Academy of Ophthalmology.*

Acute postoperative endophthalmitis (APE) is an infrequent event that occurs most commonly after cataract surgery, although it also may occur after surgery for glaucoma, penetrating keratoplasty, vitreous injection, and pars plana vitrectomy.[1,2] Acute postoperative endophthalmitis typically is caused by perioperative introduction of bacteria into the eye from the patient's conjunctival and skin flora or from external sources, such as contaminated surgical instruments. Patients typically have moderate to severe eye pain and decreased vision within 6 weeks of surgery. The features of APE are posterior and anterior chamber inflammation; hypopyon is present in most cases. Conjunctival hyperemia and chemosis, corneal edema, wound abnormalities, and associated eyelid or orbital inflammation also may occur.[1–6]

The consequences of APE are associated with significant morbidity and substantial cost. Despite therapeutic intervention, patients may experience severe visual loss, with the risk increasing among patients who experience infections from more virulent organisms or who delay treatment.[4,5,7] Acute postoperative endophthalmitis also incurs a significant cost burden that is approximately 1.45 times more than that of controls without APE. This translates into an estimated $12 578 in higher claims and $3464 in higher reimbursements for patients with APE.[8]

The best medicine for APE is prevention. When prevention fails, rapid recognition, diagnosis, and treatment become critical components of mitigation and management. Antibiotics are a cornerstone of both prevention and treatment; however, increasing bacterial resistance to antibiotics makes the use of these agents challenging. Although the extent of the impact of antibiotic resistance on the prevention and treatment of APE after cataract surgery is unclear, the foundation of antibiotic management should remain prophylaxis, rather than treatment of established infection.

Epidemiologic Features

Cataracts are the leading cause of vision loss in the United States. Approximately 25 million Americans have a cataract in one or both eyes, and the number of individuals in whom a cataract develops is projected to double by the year 2050[9] (Fig 1). The prevalence of cataracts also increases with age[9] (Fig 2). Cataract surgery is one of the most commonly performed ocular procedures, with 3 million procedures performed annually in the United States.[10] As a result, cataract surgery is and may continue to be a frequent cause of APE in clinical practice.

Acute postoperative endophthalmitis occurs rarely, and the reported incidence varies widely[11] (Fig 3). Whether the rate of APE after cataract surgery has been increasing or decreasing over time is controversial. In a population-based review of Medicare beneficiary claims data from 1994 through 2001, the incidence of APE after cataract surgery was 2.15 per 1000 (477 627 cataract surgeries) over an 8-year period. Adjusted for age, sex, and race, the rates were significantly higher from 1998 through 2001 than in the period before 1998.[12] In contrast, another analysis of Medicare beneficiary claims data (4006 cases of presumed endophthalmitis after 3 280 966 cataract surgeries) between 2003 and 2004 found an incidence rate of 1.32 per 1000 surgeries in 2003 and 1.11 per 1000 surgeries in 2004.[13] More recently, an ecological time-trend study in the Kaiser Permanente Diablo Service Area in California found that the incidence rate of endophthalmitis decreased from 3.13% in 2007 to 1.43% from 2008 through 2009 and to 0.14% from 2010 through 2011 (16 264 cataract surgeries).[14]

Risk Factors

Risk factors for the development of APE vary and include the following: increased operative time[15]; posterior capsular rupture or vitreous loss[15]; retained lens fragments[16]; inadequate sterilization of the operative field[17]; contamination of surgical instruments[3]; inadequate wounds (e.g., leaky), as in some cases of sutureless clear corneal cataract incisions[18,19];

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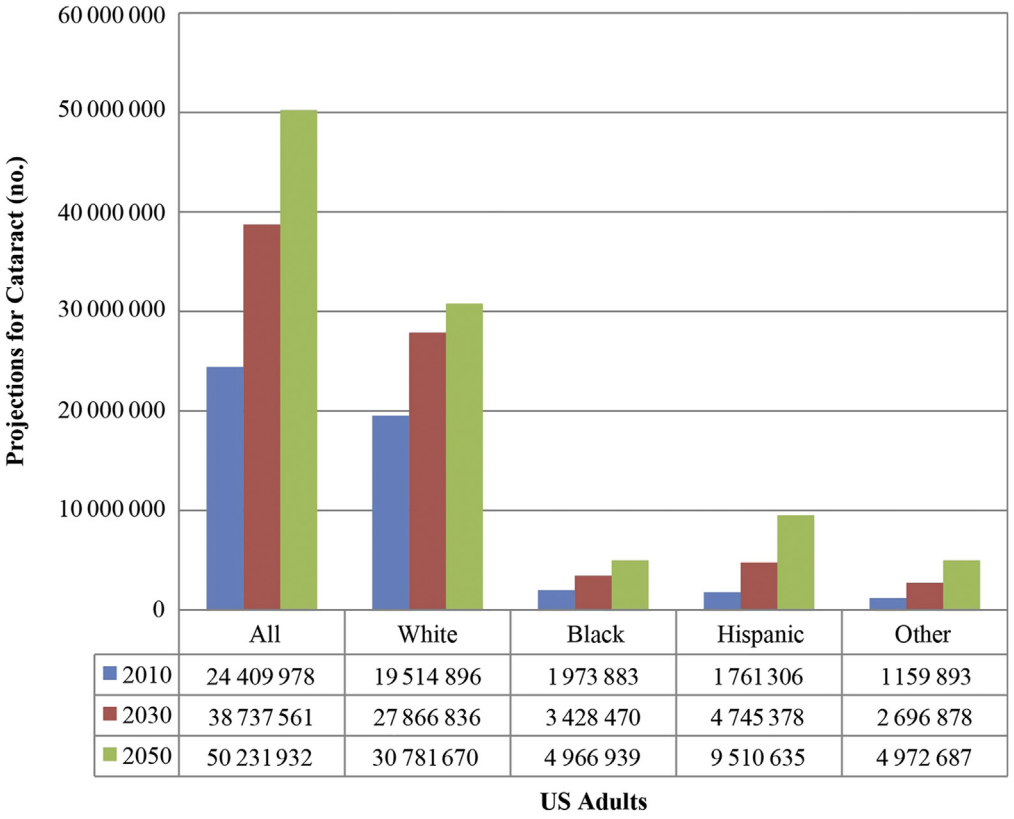
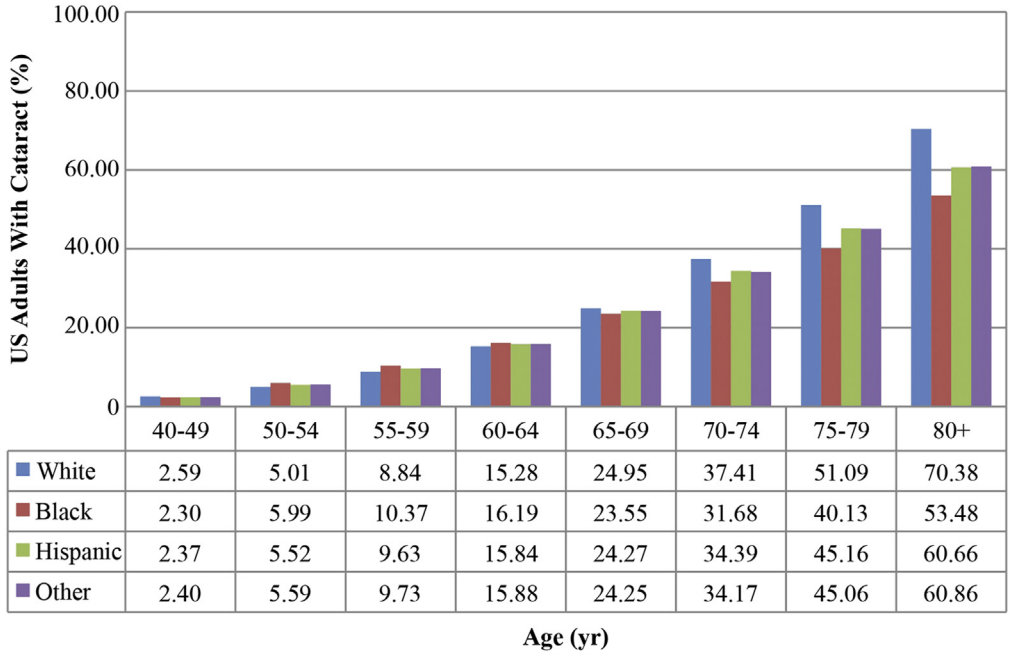


	All	White	Black	Hispanic	Other
2010	24 409 978	19 514 896	1 973 883	1 761 306	1 159 893
2030	38 737 561	27 866 836	3 428 470	4 745 378	2 696 878
2050	50 231 932	30 781 670	4 966 939	9 510 635	4 972 687

Figure 1. Bar graph showing projections for cataract in the United States (2010, 2030, and 2050).[9]

surgeon volume, surgical method, and years of experience[13,20–22]; and male sex.[23]

These and other risk factors may be preoperative, intraoperative, or postoperative[15,17] (Fig 4). Wound leakage is particularly associated with the development of APE. Experimental application of India ink showed clearly that particles traveled into all incisions, particularly after clear corneal incisions, where transiently decreased intraocular pressure caused



	40-49	50-54	55-59	60-64	65-69	70-74	75-79	80+
White	2.59	5.01	8.84	15.28	24.95	37.41	51.09	70.38
Black	2.30	5.99	10.37	16.19	23.55	31.68	40.13	53.48
Hispanic	2.37	5.52	9.63	15.84	24.27	34.39	45.16	60.66
Other	2.40	5.59	9.73	15.88	24.25	34.17	45.06	60.86

Figure 2. Bar graph showing 2010 United States (US) cataract prevalence rates.[9]