The Incidence of Endophthalmitis after Cataract Surgery among the U.S. Medicare Population Increased between 1994 and 2001

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Objective: To estimate the annual incidence rate of presumed endophthalmitis after cataract surgery, evaluate any changes in this rate over time, and examine demographic risk factors for endophthalmitis after cataract surgery.

Design: Population-based review of Medicare beneficiary claims data.

Data Source: Medicare 5% sample beneficiary data files for inpatient and outpatient claims from 1994 through 2001 were examined to identify all cataract surgeries and subsequent cases of presumed endophthalmitis after cataract surgery.

Methods: All cataract surgery and presumed endophthalmitis cases after cataract surgery were identified based on claims submitted. The annual rate of presumed endophthalmitis after cataract surgery was calculated, and demographic risk factors for endophthalmitis were examined using multivariate models.

Main Outcome Measures: Incidence rate of endophthalmitis after cataract surgery and prevalence of demographic risk factors for endophthalmitis over an 8-year period.

Results: One thousand twenty-six cases of presumed endophthalmitis occurred after 477 627 cataract surgeries, yielding an incidence rate of 2.15 per 1000 for this 8-year period. Rates of endophthalmitis adjusted for age, gender, and race were significantly higher in 1998 to 2001 than in earlier years (relative risk [RR], 1.41; 95% confidence interval [CI], 1.24–1.60). Older age and black race also were associated with increased risk of endophthalmitis (RR, 1.83; 95% CI, 1.19–2.81; age, ≥90 years, and RR, 1.30; 95% CI, 1.02–1.65, respectively).

Conclusions: Analysis of Medicare claims data suggests that the incidence of endophthalmitis after cataract surgery has been increasing, but does not provide an explanation for this occurrence. An increase in the incidence of endophthalmitis after cataract surgery is of concern, because cataract surgery is the most commonly performed operation in the United States, and the number of cataract surgeries performed annually will likely increase substantially over the coming decades due to the aging of the U.S. population. *Ophthalmology 2005;112:1388–1394 © 2005 by the American Academy of Ophthalmology.*

Despite major improvements in surgical techniques related to cataract surgery that have occurred over the past 20 years, endophthalmitis after cataract surgery remains a devastating complication of this very common procedure. The majority of cases of postoperative endophthalmitis involve infections caused by gram-positive organisms that are normal inhabitants of the lid and conjunctiva. It is felt that such bacteria gain access to the intraocular space either through direct inoculation during surgery or due to some problem with the surgical wound postoperatively. Although relatively rare, the development of endophthalmitis requires immediate intervention with intravitreal antibiotic injection and, often, vitrectomy and is associated with the potential for significant loss of vision. Efforts to prevent endophthalmitis include a significant amount of routine perioperative care, including the use of preoperative and postoperative topical antibiotics, the preoperative use of antiseptics such as povidone–iodine, and careful preparation and draping of the operative field. Over the past 20 years, cataract surgery has become a shorter procedure, with less open eye time, and has had better visual and functional outcomes. Small-incision cataract surgery by phacoemulsification requires less surgical time than the standard extracapsular cataract extraction (ECCE) it largely replaced; the wounds are smaller, and healing is more rapid.[1] One might hypothesize that such

Originally received: August 17, 2004.
Accepted: February 27, 2005. Manuscript no. 2004-19.

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Supported in part by the National Eye Institute, Bethesda, Maryland (grant no.: NEI K2400395), and the Grossman Fund for Preventive Ophthalmology, Baltimore, Maryland.

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Published by Elsevier Inc.
ISSN 0161-6420/05/$–see front matter
doi:10.1016/j.ophtha.2005.02.028

changes are associated with lower rates of post–cataract surgery endophthalmitis. Yet, case series published over the past decade are not consistent with a decline in post–cataract surgery endophthalmitis rates. Recent syntheses of the literature found that endophthalmitis rates reported after cataract surgery have been increasing since 1992,[2] whereas endophthalmitis rates after corneal transplantation have decreased or stayed the same during the same period.[3] Endophthalmitis rates also vary substantially by center, perhaps reflecting more or less successful prophylaxis measures, varying surgical techniques, or variations in patient profiles. For example, rates of endophthalmitis reported from specific centers after 1990 range from 0.36/1000 to nearly 4/1000 surgeries.[4–11] Such variability in center-specific rates makes it difficult to draw firm inferences from published case series about trends in endophthalmitis rates. The rarity of endophthalmitis also makes it difficult for individual surgeons or centers to be sensitive to changes in its incidence in their own settings or communities. For example, a surgeon performing as many as 500 cataract surgeries per year is likely to experience just one or no cases of his or her own in a given year.

Evaluation of a large United States population-based sample provides the opportunity to examine changes in the incidence of endophthalmitis after cataract surgery over time in this country. Using data from Medicare billing files, Javitt et al[12] derived estimates for endophthalmitis after cataract surgery from a national sample of 338 141 patients 65 years and older undergoing cataract surgery in 1984. In this cohort, patients who underwent intracapsular cataract extraction (ICCE) were more likely to develop postoperative endophthalmitis (0.17%) within 1 year than patients undergoing ECCE or phacoemulsification (0.12%, for both ECCE and phacoemulsification). At that time, ECCE had recently displaced ICCE as the predominant cataract surgical procedure in the U.S. Furthermore, eyes that underwent anterior vitrectomy after cataract surgery, regardless of procedure, were more likely to develop endophthalmitis than eyes without vitrectomy. Since that cohort was studied, both ICCE and standard ECCE (i.e., using incisions of 8 to 12 mm and manual expression of the lens nucleus) have become rare, and phacoemulsification using smaller incisions (i.e., ultrasound fragmentation of the lens nucleus using wounds of 3 to 4 mm) has become the dominant surgical procedure. Using analogous methodologies on the Medicare billing database, we identified a cohort of beneficiaries who underwent cataract surgery between 1994 and 2001 and developed endophthalmitis after cataract surgery. We used these data to evaluate incidence rates of presumed endophthalmitis after cataract surgery across these years and to examine several potential risk factors for development of endophthalmitis.

Materials and Methods

Data for this project were derived from Medicare beneficiary claims files. All years of data that were available at the time of writing were used for our analyses. Data were available in 2 forms: research identifiable files (RIFs) and beneficiary encrypted files (BEFs). These 2 databases are very similar, with 2 exceptions: the degree of information regarding the date of service and the level of patient identifiers. The RIFs contain the exact date of billing and complete identifying information, whereas the BEFs contain the calendar quarter in which the billing was filed and encrypted identifiers. Additionally, BEFs contain de-identified information, whereas the entire RIF database includes patient identifiers (the authors did not have access to any identifiers for this analysis). Both RIF and BEF databases contain a series of files including claims information for physician/suppliers, inpatient procedures, and outpatient procedures and an enrollment file that provides demographic information. Both datasets contain the same information on the same population of beneficiaries, and all data relating to diagnosis and treatment procedures are the same in both databases. Beneficiary encrypted files were available for 1994 through 1999, and RIFs were available for the years 1997 through 2001. Thus, we had 3 years in which data were available for both files, allowing us to confirm that data were very similar between the 2 databases for each of these 3 years.

Each database was searched for the primary procedure code of cataract extraction using the Current Procedural Terminology codes[13] in Table 1. Cataract surgeries were limited to 2 surgeries per patient within a database and 1 surgery per patient per calendar quarter. Additionally, all individuals who underwent corneal transplant or trabeculectomy in the same quarter as cataract surgery were removed, as it is likely that endophthalmitis rates after these combined procedures are higher than rates among procedures limited to cataract surgery alone.

Files were searched for primary diagnosis of endophthalmitis using the International Classification of Diseases 9 (ICD9), Clinical Modification codes[14] reported in Table 1 and were limited to one event per person. Claims were limited to individuals 65 years and older who had continuous part A or B coverage for the year of surgery and were not members of a health maintenance organization. We characterized as cases of presumed endophthalmitis those

Table 1. Disease and Procedure Codes Used in Analyses

	Description
CPT code	
66840	Removal of lens material; aspiration technique, ≥1 stages
66850	Phacofragmentation technique (mechanical or ultrasonic) (e.g., phacoemulsification) with aspiration
66920	Intracapsular
66930	Intracapuslar, for dislocated lens
66940	Extracapsular (other than 66840, 66850, 66852)
66982	Extracapsular cataract removal with insertion of IOL prosthesis (1-stage procedure), manual or mechanical technique (e.g., irrigation and aspiration or phacoemulsification) complex, requiring devices or techniques not generally used in routine cataract surgery
66983	Intracapsular extraction with insertion of IOL prosthesis (1-stage procedure)
66984	Extracapsular cataract removal with insertion of IOL prosthesis (1-stage procedure), manual or mechanical technique (e.g., irrigation and aspiration or phacoemulsification)
ICD9 code	
360.00	Purulent endophthalmitis, unspecified
360.01	Acute endophthalmitis
360.02	Panophthalmitis
360.03	Chronic endophthalmitis
360.04	Vitreous abscess

CPT = Current Procedural Terminology; ICD9 = International Classification of Diseases 9; IOL = intraocular lens.

instances in which an individual had claims submitted for cataract surgery and for a diagnosis of endophthalmitis within the timeframes described below.

Cataract surgery cases were classified based on the year of the procedure. Early years included surgeries before 1998, and late years included procedures from 1998 to 2001. This classification divides the period under observation in half and reflects a comparison of years in which clear corneal incisions were used by a substantial percentage of surgeons and years when they were used less frequently.[15]

Most cases of endophthalmitis after cataract surgery occur within the first few weeks postoperatively. Virtually all occur within the first 3 months/90 days. However, the BEFs contain information at only the calendar quarter level. Thus, it is impossible to determine exact dates of service and to create a precise 90-day postsurgery window. To estimate the true 90-day rate, we calculated endophthalmitis rates based on events that occurred within the same quarter or during the quarter after the cataract surgery. These 2 sets of rates provide upper and lower bounds of the true 90-day incidence rate, respectively. For the RIFs (1997–2001), exact dates of service were available. For these years, true 90-day rates were calculated, and calendar quarters were created to calculate estimates comparable to the BEF calculations.

Endophthalmitis rates for years in which data were available from both the BEF and RIF datasets were compared to confirm consistency within a given year, and a final data file was created using all years from the RIFs and 1994 to 1996 data from the BEFs. Analyses were then performed based on endophthalmitis cases using the 2-quarter format (cases that occurred within the same quarter or the quarter after cataract surgery). For all final analyses, sensitivity analyses were performed to test consistency of findings using the BEF versus RIF data for overlapping years and also to test differences in conclusions based on 2- versus 1-quarter postsurgery endophthalmitis cases.

Endophthalmitis rates by age, gender, and race were calculated. Yearly endophthalmitis rates also were determined, and a Mantel–Haenszel test for trend was performed. Logistic regression models were fitted to evaluate differences in endophthalmitis rates across years, after controlling for age, gender, and race. Two sets of models were fitted. First, the relative risk (RR) of endophthalmitis in each year was evaluated compared with the reference year, 1994. Next, models were fitted to estimate the RR of endophthalmitis in late years of surgery (1998–2001) versus early years (1994–1997).

Results

The BEF and RIF datasets provided similar rates of endophthalmitis (Table 2), and as expected because of the increased number of days included, the 2-quarter rate was slightly higher than the 1-quarter rate for a given year. Among years with date-specific data available, 90-day postsurgery endophthalmitis rates ranged from 1.60 cases per 1000 surgeries in 1997 to 2.29 per 1000 in 2001 (Table 2). For years where BEFs and RIFs were both available, endophthalmitis rates did not differ significantly between the 2 sets of data for a given year (P = 0.76). The 2-quarter rate approximated the actual 90-day rate, as evidenced by the years for which data on exact date of service were available (Table 2). Thus, for all primary analyses, the 2-quarter data were utilized.

Our final dataset included 477 627 cataract surgeries among 381 756 beneficiaries over an 8-year period (Table 3). Approximately 25% of individuals had bilateral surgery during this period. One thousand twenty-six post–cataract surgery endophthalmitis cases within the same or following calendar quarter of cataract surgery were identified. In 1994 to 1997, the post–cataract surgery incidence of endophthalmitis was approximately 1.8 cases per 1000, whereas in 1998 to 2001 the rate was approximately 2.5 cases per 1000 for each year (Table 4). Over this period, there was a significant increase in the post–cataract surgery endophthalmitis rate (Mantel–Haenszel test for trend, $P<0.0001$). Overall, endophthalmitis rates increased with age. For every 10-year increase in age, individuals were 16% more likely to develop endophthalmitis (P = 0.001), and there were 3.19 endophthalmitis cases per 1000 surgeries among beneficiaries 90 years and older (Table 3). Endophthalmitis rates varied by race, with blacks having the highest rate, 2.73 cases per 1000 surgeries.

The age-, race-, gender-adjusted risk of endophthalmitis after cataract surgery was significantly higher in 1998 to 2001 than in earlier years (RR, 1.41; 95% confidence interval [CI], 1.24–1.60) (Table 5). In addition, risk of endophthalmitis increased with increasing age, after adjustment for race, gender, and year of surgery. Individuals 90 years and older were 1.83 times more likely to develop postsurgical endophthalmitis than 60- to 65-year-old individuals (95% CI, 1.19–2.81), and blacks were 30% more likely to develop endophthalmitis than whites (RR, 1.30; 95% CI, 1.02–1.65).

Discussion

The findings from this study suggest that endophthalmitis rates after cataract surgery increased in the U.S. between 1994 and 2001. Due to the lag in the availability of Medicare data for such analyses, we cannot comment on whether the endophthalmitis rate after cataract surgery has since stabilized or continued to increase. We report an endophthalmitis rate of 1.79 cases per 1000 in 1994 and a rate of 2.47 cases per 1000 in 2001, a 37% increase over this 8-year

Table 2. Comparison of Data from Beneficiary Encrypted Files (BEFs) and Research Identifiable Files (RIFs)

	RIF Data				BEF Data		
		Rate within:				Rate within:	
Year	*No. of Surgeries*	*Same Calendar Quarter*	*90 Days*	*Same or Next Calendar Quarter*	*No. of Surgeries*	*Same Calendar Quarter*	*Same or Next Calendar Quarter*
1994					56 930	1.39	1.79
1995					60 440	1.42	1.80
1996					60 932	1.48	1.92
1997	61 188	1.47	1.60	1.73	63 382	1.42	1.70
1998	59 225	2.08	2.21	2.53	60 129	2.06	2.36
1999	59 021	2.02	2.05	2.32	60 065	1.91	2.18
2000	58 813	2.13	2.36	2.62			
2001	61 077	2.14	2.29	2.47			

Table 3. Incidence of Presumed Endophthalmitis by Age, Race, and Gender among Cataract Surgery Patients

Variable	No. of Cataract Surgery Cases	No. of Endophthalmitis Cases	Incidence of Endophthalmitis per 1000 Surgeries	95% Confidence Interval
Age (yrs)				
65–69	111 087	210	1.89	1.63–2.15
70–79	252 878	546	2.15	1.96–2.32
80–89	106 460	247	2.32	1.98–2.56
≥90	7202	23	3.19	2.02–4.79
Race				
White	434 949	920	2.11	1.98–2.26
Black	26 401	72	2.73	2.13–3.43
Hispanic	5188	12	2.31	1.20–4.04
Other	8641	16	1.85	1.06–3.01
Unknown	2448	6	2.45	0.9–5.33
Gender				
Male	166 310	366	2.20	1.95–2.40
Female	311 317	660	2.12	1.96–2.29

period. Two additional countrywide population-based studies recently were conducted to evaluate postsurgical endophthalmitis rates. An evaluation of all cataract surgeries performed in Sweden in 1998 showed an endophthalmitis incidence rate of 1.06 per 1000 surgeries,[16] whereas an Australian population-based study reported a fairly consistent rate of 2.0 cases per 1000 surgeries across a 20-year period.[17,18]

Analysis of Medicare administrative data is a useful technique for estimating rates of rare events. However, these data alone do not contain sufficient clinical detail to explain the observed secular changes in rates. One hypothesis for the increased rate is the change from scleral tunnel to clear corneal incisions. Clear corneal incisions were introduced in the U.S. in 1992.[19] Survey data from the American Society of Cataract and Refractive Surgery have indicated a trend toward increased acceptance of the technique, with 1.5% of the respondents reporting preference for clear corneal incisions in 1992, 30% in 1997, and 47% in 2000.[15] Our data show a substantial increase in endophthalmitis rates since 1998, which coincides temporally with these survey results. The use of clear corneal incisions may increase the potential for pathogens to enter the eye because the integrity of the wound may change with changes in intraocular pressure (IOP). Studies have shown that blinking or squeezing the eye results in a significant pressure change,[20–22] and that IOP changes significantly during the immediately postoperative period.[23,24] Recent animal and cadaver models using ocular coherence tomography have demonstrated that a significant change in IOP permits the flow of liquid from the outer surface of the eye past the stroma,[25] potentially allowing pathogens to enter the eye after the surgery has been completed. The angle and location of the wound also can affect ability of extraocular fluid to enter the eye.[26]

Several small regional controlled studies of endophthalmitis after cataract surgery comparing clear corneal with scleral or limbal incisions have shown an association between incision type and risk of endophthalmitis. In a study from St. Louis based on 38 cases of endophthalmitis and 371 controls, patients undergoing cataract surgery with a corneal incision were 3.4 times more likely to develop endophthalmitis than patients with scleral tunnel incisions.[27] In a recent multicenter randomized trial of 11 595 patients by Nagaki et al, the RR of endophthalmitis was 4.6 times higher in patients undergoing clear corneal incisions than in those undergoing sclerocorneal incisions.[28] Similarly, in a small case–control study (31 cases and 66 controls), Lertsumitkul et al reported a 3.5-fold increased risk of endophthalmitis with corneal temporal incisions versus superior scleral incisions.[29] Finally, John and Noblitt reported a significantly increased incidence of endophthalmitis comparing clear corneal and scleral tunnel incisions (2.9/1000 and 0.2/1000, respectively; $P<0.006$) among surgical cases performed at a single center.[30] Although these studies provide consistent evidence for an association between incision type and endophthalmitis, most are based on observations from a single center or involved only a few cases and cannot be generalized to an entire population.

Our data also demonstrate significant independent associations between age and ethnicity with risk of endophthalmitis. These associations were not found in the Medicare analyses of 1984.[12] However, a recent Australian population-based survey also found an increased risk of endophthalmitis with increasing age (odds ratio, 1.50; 95% CI, 1.13–1.99),[17] and a Danish study also showed that individuals 90 years and older were 3.6 times more likely to develop endophthalmitis (95% CI, 1.5–8.6).[31] Older age may be related to relevant physiologic factors such as slower healing or reduced resistance to infection. Alternatively, the association may be related to longer surgical time due to a greater density of cataract or to factors related to compliance with postoperative care. Regarding the association with race, the authors are not aware of any biologic explanation for this. However, there is ample evidence in the literature that blacks have increased rates of a variety of medical problems, most likely due to barriers to optimal care.[32–34] It is also possible that age and race are associated with other factors (e.g., diabetes, perioperative management), which are more explanatory. However, Medicare

Table 4. Rates of Presumed Endophthalmitis across Years

Year	No. of Surgeries	No. of Endophthalmitis Cases	Rate/1000 Surgeries within Same or Next Calendar Quarter*	95% Confidence Interval
1994	56 930	102	1.79	1.46–2.18
1995	60 440	109	1.80	1.48–2.18
1996	60 932	117	1.92	1.59–2.30
1997	61 188	106	1.73	1.42–2.10
1998	59 225	150	2.53	2.14–2.74
1999	59 021	137	2.32	1.95–2.74
2000	58 813	154	2.62	2.22–3.07
2001	61 077	151	2.47	2.08–2.88

*Mantel–Haenszel test for trend, 1 degree of freedom, $P < 0.0001$.

administrative databases do not contain sufficient clinical information to explore such hypotheses.

Although the results of this study indicate an increase in the incidence of endophthalmitis over the 8 years studied, it is important to note the limitations of the data. First, we have made the assumption that cases of endophthalmitis occurring soon after the cataract surgery were related to that surgery. Given the rarity of endogenous and traumatic endophthalmitis, we believe that is a reasonable assumption. Second, we cannot determine whether the increase is directly associated with specific changes in technique, such as the use of clear corneal incisions, because these databases do not provide any information to address such questions directly. In addition, because the databases do not contain information on laterality, we cannot determine which eye(s) underwent cataract surgery and which had endophthalmitis. A similar potential limitation existed for an initial analysis of the association between retinal detachment (RD) and yttrium–aluminum–garnet (YAG) capsulotomy.[35] However, when that question was subsequently reanalyzed after obtaining access to laterality[36] (i.e., documentation that the RD and YAG capsulotomy occurred in the same eye), no significant difference in the magnitude of that association was found. Also, we do not have data available on comorbid conditions, surgical practices such as type and frequency of antibiotics, etc. Previous studies have shown an association between diabetes and incidence of endophthalmitis after cataract surgery,[37] whereas others have found no association.[28,38] We are unable to control for such factors that could contribute to temporal changes in endophthalmitis risk. However, we believe that the prevalence of many of the risk factors, such as diabetes, over this time, is unlikely to have changed sufficiently to explain the difference in rates seen across years. If changes in surgical practices underlie the increase in risk observed, additional studies that capture such information need to be conducted.

Another potential limitation relates to the diagnosis of endophthalmitis. The analyses presented here are based on medical claims indicating a diagnosis of endophthalmitis soon after a bill for cataract surgery had been submitted. Medical coding for endophthalmitis does not require culture-proven endophthalmitis. It is possible that a small portion of endophthalmitis cases in our cohort had an acute postoperative inflammatory episode that was not due to infection with a microbial organism (but yet was coded as endophthalmitis), leading to the inclusion of false positives. However, it is unlikely that this false-positive rate is differential across any of the factors that we examine here. In the absence of some systematic change in the way cataract surgery or endophthalmitis was coded during the ascertainment period, the inclusion of false positives might inflate the absolute rate reported in each year but not change the relative rate. After consulting several retinal surgeons, the Current Procedural Terminology and ICD9 coding books current during the study period, and a Medicare medical director, the authors have not found evidence for systematic coding changes that occurred over the study period. If there were a temporal trend associated with a lower threshold for diagnosing and treating presumed endophthalmitis over the period studied, this would have the effect of making it seem as if the endophthalmitis rate had increased. Although it is true that endophthalmitis is often treated in an outpatient setting with treatment limited to intravitreal antibiotic injections, this would only explain an *apparent* increase in endophthalmitis rates if one also assumed that the threshold for referral to a retinal specialist for evaluation of suspected endophthalmitis had also become lower during the same period.

Finally, as previously indicated, the use of quarters instead of dates of service does not provide precise estimates of 90-day postsurgery endophthalmitis rates. The 2-quarter rates used here slightly overestimate the true 90-day rate (Table 2); however, this overestimation is constant across years and should not systematically bias the overall findings of this study regarding the substantial increase in rates observed for the period studied.

In conclusion, we have found that national rates of presumed endophthalmitis after cataract surgery increased substantially between 1994 and 2001. In 2001, approximately 1 in every 400 cataract surgeries seems to have been followed by an episode of endophthalmitis, and among patients ≥90 years old, the rate approached 1

Table 5. Risk Factors for Presumed Endophthalmitis after Cataract Surgery

	Relative Risk	95% CI
Age (yrs)		
65–69	1.0	Reference
70–79	1.17	0.99–1.37
80–89	1.28	1.06–1.53
≥90	1.83	1.19–2.81
Male	1.04	0.91–1.18
Race		
White	1.0	Reference
Black	1.30	1.02–1.65
Hispanic	1.08	0.61–1.91
Other	0.88	0.53–1.44
Year of Surgery		
1994–1997	1.0	Reference
1998–2001	1.41	1.24–1.60

CI = confidence interval.

in 300. Cataract surgery is the most commonly performed surgical operation. There are currently approximately 1.7 million cataract surgeries performed annually in the Medicare population. The age distribution of the U.S. population is anticipated to undergo dramatic change over the next 25 years, with a 75% increase in the proportion of the population that is 85 and older and an absolute increase in the number of individuals age ≥85 of over 5 million.[39] This will surely result in a significant increase in the number of cataract surgeries performed. It will be important to identify and then overcome the risk factors underlying the observed increase in rates of endophthalmitis. Otherwise, we can predict an increase in endophthalmitis cases over the coming decades as well.

The authors believe that the findings of this study highlight the need for additional research on risk factors for endophthalmitis after cataract surgery based on large representative populations. Investigations limited to administrative databases, such as this one, will be useful only to estimate rates and time trends. To identify risk factors that may lead to specific interventions (e.g., changes in surgical technique or perioperative management), such studies must have access to individual patient and surgical data. Given the estimated incidence of endophthalmitis after cataract surgery, it is infeasible now to consider multiple randomized trials of different surgical techniques or perioperative antibiotic management strategies that might affect endophthalmitis rates. However, once adequate risk factor studies are complete, trials or even observational studies that test modifications of such risk factors (e.g., a change in wound construction/closure) are warranted.

Acknowledgments. The authors gratefully acknowledge the assistance of Gerry Anderson and Robert Herbert in providing de-identified datasets for analyses.

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Errata

With apologies from the authors, an inconsistency was found in the article "Incision sizes before and after implantation of foldable intraocular lenses with 6 mm optic using Monarch and Unfolder injector systems" (2005 Jan;112:58–66). The corrected Table 4 appears below with changes in boldface.

Table 4. Shape, Outer Size, Outer Circumference, Area of the Injector Tip, and Mean Incision Size

Injector (IOL)	Shape	Outer Size (mm)	Outer Circumference (mm)	Area (mm^2)	Mean Incision Size (mm)
Monarch II A (Alcon MA60BM)	Oval	2.69×1.98	**7.38**	**4.18**	3.74±0.15
Monarch II B (Alcon SA60AT)	Oval	2.41×1.83	**6.69**	**3.46**	3.44±0.16
Monarch II C (Alcon SA60AT)	Oval	2.21×1.73	**6.21**	**3.00**	2.96±0.11
Unfolder Sapphire (AMO AR40e)	Round	2.46	**7.73**	**4.75**	3.52±0.09
Unfolder Emerald (AMO AR40e)	Round	2.18	**6.85**	**3.73**	3.11±0.14
Unfolder Silver (AMO Clariflex)	Round	2.18	**6.85**	**3.73**	3.15±0.11

IOL = intraocular lens.

With apologies from the publisher, in the article "An evaluation of image quality and accuracy of eye bank measurement of donor cornea endothelial cell density in the Specular Microscopy Ancillary Study" (2005 Mar;112:431–40) the first reference in the reference list is misnumbered as 3. The first reference is 1 and relates to the reference 1 indicated in the text.