Wound Complications Following Cataract Surgery

A Case-Control Study

Jorge L. Arango, MD; Curtis E. Margo, MD, MPH

Objective: To determine whether selected preoperative medical, social, or behavioral factors predict the occurrence of cataract wound complications.

Patients and Methods: Patients who underwent cataract surgery at a Veterans Administration hospital were used in a case-control study. Cases were defined by the occurrence of any postoperative cataract wound gape with or without iris prolapse within 12 weeks of surgery and requiring repair in the operating room. Controls were patients who had no postoperative complications. Two controls were selected for each case patient and matched for surgeon.

Results: Thirty-one patients with postoperative wound complications occurred after 2041 cataract extractions (1.5%). Occurrence of wound complications was predicted by previous hematologic disorder (odds ratio, 2.9; 95% confidence interval, 1.1-8.1). Phacoemulsification surgery had a protective effect against wound complication (odds ratio, 0.2; 95% confidence interval, 0.09-0.64). There was no difference in final visual acuity and refractive indexes in patients with and without wound complications (P = .6 by Student t test).

Conclusions: Most medical, social, and behavioral preoperative factors have limited discriminatory power in predicting who will have postoperative cataract wound complications. The association of previous hematologic disorders to predict the occurrence of wound complications varied with the level of alcohol use. Although this study was not primarily designed to assess the role of surgical technique, phacoemulsification cataract extraction had a statistically significant protective effect against wound complications. Visual outcome in patients with postoperative wound complications is generally very good.


From the Section of Ophthalmology, James A. Haley Veterans Hospital, Tampa, Fla, and the Department of Ophthalmology, University of South Florida, College of Medicine, Tampa.
PATIENTS AND METHODS

Patients with postoperative wound complications were identified from the surgical registry of the James A. Haley Veterans Hospital, Tampa, Fla, from October 1, 1988, through December 31, 1996. A postoperative wound complication was defined as any abnormal gaping of the cataract wound with or without iris prolapse occurring within 12 weeks of surgery that was serious enough to necessitate surgical repair in the operating room. Cataract surgery was defined as the elective removal of the crystalline lens and/or the implantation of an artificial lens for the purposes of improving visual function. The extracapsular techniques used included manual nuclear expression and removal of the lens nucleus as well as phaco-emulsification. Patients with cataracts removed during corneal transplantation and glaucoma filtration surgery, primary posterior segment surgery, and surgical repair of ocular trauma were excluded.

Control patients were randomly selected from the same surgical registry and matched for resident surgeon. Two controls were selected for each case patient. The dates of surgery for case and control patients did not usually exceed 3 months. Ten percent of medical records were abstracted a second time in a masked fashion to measure intraobserver and interobserver agreement.

Medical records of case patients and control patients were reviewed for the following preoperative medical, social, and behavioral factors: general medical and ocular comorbidities, number of medications, history of smoking and alcohol intake, preoperative visual acuity, and visual acuity of untreated eye. The presence or absence of the following medical conditions were recorded: cardiac dysrhythmia (excluding first-degree atrioventricular block and sinus arrhythmia), "clinically significant" rheumatologic disorder, hematologic disorder, neurologic or psychiatric disorder, cardiac disorder, previous fall requiring medical treatment, and previous accidental injury requiring hospitalization. Criteria used to determine "clinically significant" medical conditions included referral to a specialist for care, hospitalization for the condition, or a condition requiring 3 or more outpatient visits for management. Living condition was recorded as sheltered, homeless, or unknown. Intraoperative complications, the time of final refraction, final refractive error, and final visual acuity were recorded.

Visual acuity scores were converted to log of the minimum angle of resolution (logMAR) for nonparametric statistical analysis. Each off-the-chart score (ie, visual acuity <20/400) was assigned a value of 0.3 logMAR so that counting fingers at 19 to 10 ft (5.7-3.0 m) was 1.6 logMAR; counting fingers at 9 to 1 ft (270-30 cm), 1.9 logMAR; hand motion, 2.2 logMAR; and light perception, 2.3 logMAR. Alcohol use and smoking, if active within the last year, were each graded on a scale of 1 to 3 with 1 indicating no use; 2, less than 6 beers (72 oz) per day (or equivalent distilled alcohol) or less than 1 pack of cigarettes per day; and 3, greater than level 2 amounts.

Patient characteristics and outcome measures were examined using contingency tables and relative risk estimated for matched data with 2 controls per case.24,25 Stratified analysis was analyzed using the methods of Mantel-Haenszel.26 For the purposes of stratified analysis, preoperative visual acuity of the eye that was operated on and that of the other eye was divided into 2 strata at 0.7 logMAR. The 2-tailed Student t test and Wilcoxon signed rank test were used to examine the null hypothesis that the population sample mean difference is zero. Test selection depended on assumptions about the normality of the population distribution. Univariate logistic regression and multivariate conditional and nonconditional logistic regression were performed to analyze the relationship between preoperative patient characteristics and outcome.27 Frequency matched data (ie, year of resident training) was used for nonconditional logistic regression models. Stepwise model building techniques using repeated application of selection-deletion modification were used.25 The postoperative cataract wound status was the dependent variable and the preoperative clinical and social factors were independent variables. If the stratified analysis indicated that the association between a potential risk factor and risk of wound complication was modified by another risk factor, a test was performed to determine whether this interaction was statistically significant in a multiple logistic regression model. This was accomplished by first multiplying the 2 risk factor terms to create a first-order interaction term. A likelihood ratio statistic test was then performed to determine whether this product term was a significant predictor of wound complication.29

This study was approved by the Hospital Institutional Review Board.

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<thead>
<tr>
<th>Disorder</th>
<th>No. of Patients</th>
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<tbody>
<tr>
<td>Anemia, not classified</td>
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<tr>
<td>Secondary polycythemia</td>
<td>2</td>
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<tr>
<td>Thrombocytopenia</td>
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<tr>
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<tr>
<td>Anemia of chronic disease</td>
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<tr>
<td>Iron deficiency anemia</td>
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<tr>
<td>Megaloblastic anemia</td>
<td>2</td>
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<tr>
<td>Coagulopathy</td>
<td>1</td>
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The relative risk of wound complication associated with hematologic disorder varied with the level of alcohol use.
The overall proportion of 1.4% wound complications in this study falls within the 0% to 3.0% range reported in the literature. The results were examined according to type of surgery, and phacoemulsification extraction displayed a 5-fold protective effect relative to extracapsular cataract extraction, a finding that was statistically significant. Although not a primary outcome measure of this study, the difference in risk between extraction methods adds considerable support to the theory that a small-incision phacoemulsification wound is structurally more secure than the larger incision with standard extracapsular cataract extraction.

The preoperative risk factors in this study were selected because of their potential to discriminate among patients who are prone to fall, live in a high-risk environment for injury, or may lack insight or resources for following postoperative instructions. Analysis of these factors revealed a history of previously diagnosed hematologic disorder predictive of postoperative wound complications. A variety of other medical, social, and behavioral factors had no predictive power in this setting. The association of hematologic disorder and wound complication varied with the level of alcohol use, with the greatest risk occurring in patients with the greatest alcohol consumption. Effect modification exists when the association between exposure and outcome varies by levels of a third factor. Detection of effect modification usually requires a sample size several times larger than that required to detect the main effect. Despite our small sample size, the interaction between hematologic disease and alcohol consumption was statistically significant at the 0.1 level. We suspect that heavy alcohol consumption is a risk factor for postoperative wound complications in patients who are prone to fall.
cesses. It is possible that smaller statistically significant associations may exist, but cannot be identified in a case-controlled study with only 29 case patients.

An important source of bias in a case-control study is unequal exposure of cases and controls to a variable linked to outcome. In our study, differences in resident surgeon skill could have been such a factor. To effectively eliminate this potential confounder, cases and controls were matched by surgeon. Since matching can also introduce confounding as well as control for it, no other variables were matched. It is unlikely in this particular study, however, that an important preoperative patient-related confounder could be introduced when matching for surgeon.

A second source of bias in retrospective case-control studies is unequal surveillance of cases and controls. The so-called exposures in this study were major medical, social, and behavioral conditions that can be easily identified through a routine medical history taking. Because the majority of patients in this study were elderly and used a veterans hospital for primary care, most histories and physical examinations were performed by the medical service. All exposure data were completed before the outcome event had occurred, which reduces observer bias. Criteria used to identify “clinically significant” were kept simple and are unlikely to be overlooked by their very nature.

How generalizable are the results of this study? Surgical procedures were performed by residents, but the results are probably applicable to the clinical setting beyond formal training. The study was designed to analyze patient-related risk factors. Potential confounding variables related to surgeon and the introduction of “new” techniques were minimized by matching for surgeon and keeping dates of procedures on case and control patients within 3 months of one another. Studies dealing with faculty-supervised cataract extraction performed by residents have shown that the visual results are very good for both standard extracapsular and phacoemulsification techniques.

Visual acuity results have exceeded the standard used for premarket approval application for intraocular lens implants to the US Food and Drug Administration. The patients in this study were mostly elderly white men (median age, 67 years) with a high proportion of general medical problems. The high prevalence of medical and social problems in this population of patients makes them an effective population to test our study hypothesis. We believe that our results apply to a healthier population of patients, but because most patients were white men, these results may not be as applicable to women and blacks.

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Corresponding author: Curtis E. Margo, MD, MPH, Department of Ophthalmology, Watson Clinic, 1600 Lake-land Hills Blvd, Lakeland, FL 33805.

REFERENCES