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Examining Absolute Risk of Age-Related Macular Degeneration in Relation to Cataract Surgery

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Cataract surgery is a common procedure in older adults.¹ It is becoming more common not only by virtue of increasing age of the population but also because of trends in ophthalmic practice. Higher prevalence and incidence of late age-related macular degeneration (AMD) in persons who have had cataract surgery have also previously been reported.² In the study by Klein³ the maximally adjusted odds ratio (OR) for incidence of late AMD after cataract surgery, as compared to eyes with at least one type of cataract, was 1.96 (1.28–3.02). Including the presence and severity of early AMD lesions in the model somewhat attenuated the overall OR, however the effect of surgery remained statistically ($p < .05$) significant. Knowledge of the approximate doubling of the odds of late AMD is of limited use when making recommendations or decisions in clinical practice as this does not place the increased odds in the context of the actual risk.⁴ In the current report we describe the adjusted attributable risk estimate and number needed to harm to provide a measure of absolute risk when evaluating the effect of cataract surgery on incidence of late AMD.

This report is derived from the Beaver Dam Eye Study, a population-based study of 4,926 persons 43–86 years of age at baseline examinations from 1988–1990. The study had greater than 80% participation at each of the four follow-up examinations every five years after baseline. All data were collected with Institutional Review Board approval from the University of Wisconsin-Madison in conformity with all federal and state laws, the work was HIPAA compliant, and the study was in adherence to the tenets of the Declaration of Helsinki. Health and lifestyle histories and examination procedures were obtained using a standard questionnaire and protocols. Photographs of the retina and the lens were taken after dilating the pupil and were graded by experienced graders. Presence of cataract surgery was determined by history and red reflex photographs. Late AMD was defined by presence of neovascular macular degeneration and/or pure geographic atrophy (GA).

Data from an eye were included for a 5-year interval if the eye was free from late AMD, had complete information on lens presence and/or cataract severity and complete covariate data at that examination, and that eye had known presence or absence of late AMD at the following examination. There were 3,329 participants contributing data from both eyes, 144 from the right eye only and 145 from the left eye only, from at least one interval.

Generalized estimating equations were used to account for the correlation between eyes over multiple intervals. Adjusted attributable risk (AR) and attributable risk fraction (ARF)

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estimates were obtained by methods described by S. Greenland.⁵ Number needed to harm (NNH) was calculated using methods described by Citrome.⁴ Estimates were obtained for an age-sex adjusted model and a maximally adjusted model.

Results demonstrated incidence of late AMD increases with increasing age in each model (Table available at <http://aaojournal.org>). The overall adjusted attributable risk fraction is 50.82%. Results differ little between the age-sex adjusted and maximally adjusted models. In the maximally adjusted model, AR is 0.48%, 1.59% and 4.02% and NNH is 208, 63, and 25 for persons younger than 65, age 65–75 and older than 75, respectively. Although the effect of cataract surgery represents a doubling of incidence of late AMD over all ages, the adjusted attributable risks are not large in any of the contrasts as late AMD is an uncommon disease and the percent incidence is low, especially at younger ages. The number needed to harm decreases with increasing age which reflects the increased incidence of late AMD at older ages in persons with and without cataract surgery.

These analyses were undertaken to describe the absolute risk, as derived solely from our data, of late AMD that may be attributed to cataract surgery in order to quantify the doubling of odds of incident AMD in persons with cataract surgery, as previously reported by our group. For late AMD the adjusted attributable risk fractions for cataract surgery compared to cataract are roughly 50%. The odds ratio associated with these comparisons (OR=1.96, 95% CI 1.28–3.02) was statistically significant.³ However, the attributable risks in the current analyses are quite small (range from 0.48 to 4.03). Thus, these analyses suggest that the risk of late AMD is enhanced in the presence of cataract surgery on a population level, but the absolute risk associated with cataract surgery is not very great.

We examined the attributable risk by age category in order to understand how age directly affected the absolute risk of AMD as associated with cataract and cataract surgery. Our data show that, although the odds of incident AMD is doubled, the absolute risk remains low due to the rarity of AMD on a population level. However, it is still important when explaining risk factors to a patient to consider the absolute risk of cataract surgery to incident AMD, especially for persons who may be at high risk for AMD due to other factors and who may not benefit from a significant improvement in vision by undergoing cataract surgery.

Limitations of this investigation include but are not limited to the following: 1- the relatively small number of cases of late AMD (N=196, 1.09% of those at risk over 20 years of follow-up); 2- the distribution of covariates, especially age, influences our estimates of the effect of cataract surgery on the outcomes; 3- the distributions and effects of these covariates may differ in other populations; 4- calculation of the NNH can be affected by rounding errors and so can only be considered an estimate or 'ballpark range'; 5- the study population is largely of Northern European extraction and findings in this group may not reflect those from other racial ethnic groups.

In summary, incidence of late AMD attributable to cataract surgery is roughly 50%, and although the attributable risk is low due to rarity of the disease, persons considering cataract surgery need to be aware of this additional risk, especially if they are predisposed to incident AMD.

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Percent Incidence, Attributable Risk and Number Needed to Harm for Late Age-Related Macular Degeneration for Cataract Surgery vs. Any Cataract.

Table

Age, years	Age-Sex Adjusted				Maximally Adjusted*			
	% Incidence	AMD	AR	NNH	% Incidence	AMD	AR	NNH
	1 Cataract	Surgery			1 Cataract	Surgery		
<65	0.43	0.85	0.42	238	0.45	0.92	0.48	208
65-75	1.51	2.96	1.45	69	1.53	3.12	1.59	63
75+	4.13	7.89	3.75	27	4.11	8.13	4.02	25
All Ages	2.16	4.17	2.01	50	2.17	4.34	2.17	46
								50.82

AMD, age-related macular degeneration; AR, attributable risk; NNH, number needed to harm; ARF, attributable risk fraction.

* Adjusted for age, age², education, smoking status, history of heavy drinking, history of cardiovascular disease Hx, history of diabetes, and diastolic blood pressure.