MAYO CLINIC

ORIGINAL ARTICLE

Association Between Cataract and Risk of Incident Atrial Fibrillation: A Nationwide Population-Based Retrospective Cohort Study

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Abstract

Objective: To identify the association between cataract and the subsequent atrial fibrillation (AF) risk.

Patients and Methods: Our retrospective cohort study was designed to analyze the Longitudinal Health Insurance Database 2000 of the Taiwan National Health Insurance program. We established a cataract cohort (n=39,347) and a noncataract cohort (n=39,347) to observe the incidence of AF. The cataract cohort included patients who were newly diagnosed with cataract from January 1, 2000, to December 31, 2010. Propensity score matching was used to form matched sets of participants with cataract and participants without cataract who share a similar value of propensity score. Univariable and multivariable Cox proportional hazards regression models were used to assess the association between having a cataract and AF.

Results: The median (range) follow-up period was 6.52 years (range, 3.76-9.19 years) and 5.88 years (range, 3.12-8.66 years) for the cataract and noncataract cohorts, respectively; the cumulative incidence curves of AF indicated that the cataract cohort had a significantly higher risk of developing AF than did the noncataract cohort (*P*<.001). Moreover, the risk of AF was 1.32-fold (95% CI, 1.18-1.48) higher in patients with cataract with surgery and was 1.21-fold (95% CI, 1.06-1.37) higher in patients with cataract without surgery than in patients without cataract.

Conclusion: The present study is the first to report that cataract is associated with an increased risk of AF.

A trial fibrillation (AF), the most common cardiac arrhythmia in the elderly population, confers increased risks of developing cerebral vascular disease, cardiac failure, and mortality.[1-6] Accumulating studies[3,7-12] support the association between inflammation and AF. In view of AF prevention, it seems reasonable to identify the vulnerable population at risk of developing AF and to detect the possible etiology of such inflammation.[3,11-14] Cataract is a frequent cause of vision loss that has been connected with both cardiovascular morbidity and mortality.[15-23] Among the proposed theories, inflammatory response, increased glycation products, and dysregulation of oxidative-antioxidative balance have attracted more attention recently.[18-20,23-30]

To our knowledge, there are no data on the association between cataract and AF in the literature. Therefore, we conducted this nationwide cohort study to evaluate whether cataract is associated with an increased risk of AF. Moreover, using cataract surgery as a surrogate marker of cataract severity, a subgroup analysis was conducted to investigate whether patients with cataract undergoing cataract surgery have an increased risk of developing AF.

PATIENTS AND METHODS

Data Source

The National Health Insurance (NHI) program, a universal program launched in March 1995, covered approximately 99% of Taiwan residents.[31] Our retrospective cohort study was conducted to analyze the Longitudinal Health Insurance Database 2000 (LHID2000) of the Taiwan NHI program. The LHID2000 contains all the registration and original claim data of approximately 1,000,000 beneficiaries enrolled in the year 2000 randomly sampled from the year 2000 Registry for Beneficiaries of the National Health Insurance Research Database.

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The NHI program and LHID2000 have been used successfully for numerous epidemiological studies and have been found to be of high quality.[32,33] This study was approved by the Ethics Review Board of China Medical University and Hospital in Taiwan (CMUH-104-REC2-115).

Study Cohorts

We established a cataract cohort and a noncataract cohort to observe the incidence of AF. The cataract cohort included patients who were newly diagnosed with cataract (*International Classification of Diseases, Ninth Revision, Clinical Modifications* [*ICD-9-CM*] code 366) from January 1, 2000, to December 31, 2010, and the index date was assigned as the first cataract diagnosis day. The comparison cohort was retrieved from the LHID2000 during the same period of 2000 to 2010. Both the cataract and noncataract cohorts excluded patients who have a history of AF (*ICD-9-CM* code 427.31) before the index date. Age, sex, index year, and comorbidities of hypertension (*ICD-9-CM* codes 401-405), diabetes mellitus (*ICD-9-CM* code 250), hyperlipidemia (*ICD-9-CM* code 272), coronary heart disease (CHD) (*ICD-9-CM* codes 410-414), heart failure (*ICD-9-CM* code 428), chronic obstructive pulmonary disease (COPD) (*ICD-9-CM* codes 490-496), peripheral arterial occlusion disease (PAOD) (*ICD-9-CM* codes 440.0, 440.2, 440.3, 440.8, 440.9, 443, 444.0, 444.22, 444.8, 447.8, and 447.9), chronic renal disease (*ICD-9-CM* code 585), hyperthyroidism (*ICD-9-CM* code 242), sleep disorders (*ICD-9-CM* codes 307.4 and 780.5), and gout (*ICD-9-CM* code 274) were used in the propensity score-matching analysis (see the "Statistical Analyses" section).[34]

Statistical Analyses

Logistic regression was used to estimate the propensity scores, in which cataract vs noncataract was the dependent variable and age, sex, index year, hypertension, diabetes mellitus, hyperlipidemia, CHD, heart failure, COPD, PAOD, chronic renal disease, hyperthyroidism, sleep disorders, and gout were the independent variables. The estimated propensity score is the predicted probability that a participant has a cataract or does not have a cataract derived from the fitted logistic regression model. Each participant was monitored from the index date until a diagnosis of AF or was censored because of withdrawal from the NHI program, death, or the end of 2011. A standardized mean difference of 0.05 or less indicates a negligible difference in means or prevalence between these 2 cohorts for continuous and categorical variables. The Kaplan-Meier method was used to estimate the cumulative incidence of AF between these 2 cohorts, with significance based on the log-rank test. Follow-up time in person-years was used to estimate the incidence density rate of AF stratified by sex, age, and comorbidity. Univariable and multivariable Cox proportional hazards regression models were used to assess the association between having a cataract and AF. The multivariable model was adjusted for age, sex, and comorbidities of hypertension, diabetes mellitus, hyperlipidemia, CHD, heart failure, COPD, PAOD, chronic renal disease, hyperthyroidism, sleep disorders, and gout. A subgroup analysis was conducted to investigate the subsequent AF risk in patients with cataract undergoing cataract surgery. All data analyses were performed using SAS version 9.4 (SAS Institute Inc.). The significance level was set at *P* less than .05 for 2-side testing.

TABLE 1. Demographic Characteristics and Comorbidity in Patients With and Without Cataract[a,b]

Variable	Without Cataract (n=39,347)	With Cataract (n=39,347)	Standardized mean difference
Age (y)	64.2±10.4	63.9±10.1	0.020
Sex			
Female	21,004 (53.4)	21,200 (53.9)	0.010
Male	18,343 (46.6)	18,147 (46.1)	0.010
Comorbidity			
Hypertension	19,562 (49.7)	18,930 (48.1)	0.030
Diabetes mellitus	4388 (11.2)	4854 (12.3)	0.040
Hyperlipidemia	10,193 (25.9)	10,092 (25.7)	0.006
CHD	8560 (21.8)	8462 (21.5)	0.006
Heart failure	1444 (3.67)	1404 (3.57)	0.005
COPD	5960 (15.2)	5769 (14.7)	0.010
PAOD	1017 (2.58)	1024 (2.60)	0.001
Chronic renal disease	955 (2.43)	1000 (2.54)	0.007
Hyperthyroidism	1100 (2.80)	1108 (2.82)	0.001
Sleep disorders	8215 (20.9)	8064 (20.5)	0.009
Gout	4604 (11.7)	4456 (11.3)	0.010

[a]CHD = coronary heart disease; COPD = chronic obstructive pulmonary disease; PAOD = peripheral artery occlusive disease.
[b]Data are presented as mean ± SD or as No. (percentage).