

Nationwide Incidence of Clinically Diagnosed Retinal Vein Occlusion in Korea, 2008 through 2011

Preponderance of Women and the Impact of Aging

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Objective: This study aimed at defining the incidence and demographics of clinically diagnosed retinal vein occlusion (RVO) in Korea.

Design: Nationwide population-based retrospective study using data entered into the Korean national health claims database from 2007 through 2011.

Participants: Data of the entire population of Korea (n = 47 990 761, based on the 2010 census) were analyzed.

Methods: The Korean national health claims database was analyzed to identify patients with RVO. Incident cases included individuals with no RVO claims in 2007, but with RVO claims in the years 2008 through 2011. The incidence rate of RVO was estimated for the entire Korean population.

Main Outcome Measures: The person-time incidence rates of clinically diagnosed RVO in Korea, including the age- and gender-specific incidence rates, were estimated.

Results: A total of 92 730 RVO cases (56.4% in women) were identified. The incidence rate of clinically diagnosed RVO during the study period was 48.31 per 100 000 person-years (95% confidence interval [CI], 48.00–48.62). The incidence rate among men and women was 42.40 (95% CI, 41.99–42.81) and 54.14 (95% CI, 53.67–54.60) per 100 000 person-years, respectively ($P < 0.001$). The highest incidence of 214.92 per 100 000 person-years (95% CI, 211.29–218.56) was observed in the age group of 70 to 74 years (186.62 [95% CI, 181.46–191.78] and 236.25 [95% CI, 231.21–241.29] per 100 000 person-years for men and women aged 70 to 74 years, respectively). The incidence rate of RVO increased as the age of the population increased—more than doubling approximately every 10 years from the second to the seventh decade of life. Retinal vein occlusion occurred more often in men 30 to 54 years of age and in men older than 85 years, but was more common in women 55 to 84 years of age.

Conclusions: This study reports the population-based RVO incidence in Korea. The RVO incidence increased exponentially as the age of the population increased, and the RVO incidence in women was 1.28 times higher than that in men. *Ophthalmology* 2014;■:1–7 © 2014 by the American Academy of Ophthalmology.



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Retinal vein occlusion (RVO) is the second most frequently occurring retinal vascular disease and one of the foremost sight-threatening conditions.^{1–3} Retinal vein occlusion is thought to be a type of arterial disease because the retinal artery compresses the adjacent retinal vein, causing hemodynamic changes, which in turn lead to the formation of thrombi.^{3–6} Systemic vascular diseases, including arterial hypertension^{7–10} and diabetes mellitus^{8,10} as well as cardiovascular disease (CVD), are considered risk factors for RVO. Moreover, an association between RVO and the development of systemic vascular diseases and CVD, subsequent to RVO, has been reported.^{6,11–13} However, the epidemiologic characteristics of this disorder are not fully understood. Furthermore, although epidemiologic studies have reported extensively on the prevalence, risk factors,

and clinical course of RVO,^{2,3,10,14–16} only a few cohort studies thus far have investigated the incidence of RVO.^{10,17–20} Previous cohort studies reported the cumulative incidence of RVO and provided information regarding the occurrence of RVO for a certain period, rather than an incidence rate of RVO, which is the number of newly diagnosed cases in a population in a specific period, such as every year. In addition, thus far, no study has estimated the nationwide incidence rate of RVO in all age groups of a general population. Korea is an ideal country for studies investigating a nationwide incidence rate of RVO because the entire Korean population is registered under the National Health Insurance System, and it is possible to obtain reliable data regarding RVO cases. Therefore, we conducted this nationwide study to evaluate the incidence rate of clinically

diagnosed RVO cases using data that were captured in the national health claim database between 2007 and 2011.

Methods

We used data recorded from 2007 through 2011 in the national health claim database of the Health Insurance Review and Assessment (HIRA) service of Korea. The Institutional Review Board of the Seoul National Bundang Hospital approved the study, which was conducted in accordance with the tenets of the Declaration of Helsinki.

The Korean National Health Insurance scheme covers approximately 97% of the Korean population and is a compulsory social insurance. Patients insured by the Korean National Health Insurance pay approximately 30% of their total medical expenses, and hospitals are required to submit claims for the remaining 70% of the expenses related to inpatient and outpatient care. Claims are accompanied by data regarding diagnoses, procedures, prescription records, demographic information, and direct medical costs. The medical expenses of the Korean population not insured by the Korean National Health Insurance are covered by the Medical Assistance Program or the Medical Care for Patriots and Veterans Affairs Scheme. Claims from these 2 schemes are also reviewed by the HIRA. Therefore, the HIRA database is very extensive, containing information for the entire Korean population, personal information of patients, and medical records related to all medical claims made in Korea.²¹ Furthermore, Korean citizens tend to seek medical attention related to retinal disorders in Korea, because the country is known to have well-trained retinal specialists and several hospitals have well-equipped facilities for the treatment of retinal diseases. Because Korean health care providers charge only 30% or less of the total medical costs of RVO-related medical care, Koreans rarely seek RVO-related medical attention in other countries, because this would involve high costs and may be inconvenient.

All Korean residents receive a unique identification number (Korean Resident Registration Number) at birth, which enables easy identification of every citizen. This is used widely in government programs and in the health care system and the HIRA database. Therefore, this database can be used to obtain the health care records and the demographic characteristics of RVO patients without any duplications or omissions.

The HIRA database manages claims using the Korean Classification of Disease, sixth edition, a modified version of the International Classification of Diseases, 10th edition, adapted for the Korean health care system. The compulsory healthcare system in Korea covers RVO-related healthcare costs. Herein, we identified RVO cases registered from 2007 through 2011 according to the first RVO diagnostic code (H34.8). The date of the earliest claim related to the RVO diagnostic code was defined as the index date. The index date was considered the incident time, and the patient was considered an incident case in that year. We were not allowed to access the HIRA database for the years 2006 or earlier; therefore, we could not exclude RVO cases diagnosed before 2007. Hence, we excluded cases that had an RVO diagnostic code during the first year of the study (2007) to remove any potential pre-existing cases of RVO.^{22,23} All remaining cases had a disease-free period of at least 1 to 4 years before the index date. These cases were regarded as new incident cases of RVO.

We designated RVO patients with the follow-up claims into 3 groups based on the period between their first consultation (the index date) and the first follow-up claim (within 3, 6, or 9 months for groups A, B and C, respectively). The existence of a claim related to RVO shortly after the first consultation can indicate RVO

severity. Patients with mild RVO and only little visual morbidity generally do not revisit their ophthalmologist. In contrast, patients with severe RVO and significant visual morbidity revisit their ophthalmologist soon after the first consultation. Therefore, groups A, B, and C could show the proportion of clinically significant RVO patients. Further, analyses of RVO incidences in these 3 subgroups may verify the characteristics of the entire group of incident RVO cases.

The population at risk was defined as the entire population of Korea based on the Population and Housing Census (PHC) of 2010 available from the Korean Statistical Information Service (available at: <http://kosis.kr>; accessed September 17, 2013), instead of the beneficiaries of health insurance. The number of beneficiaries in 2010 was 50 581 191. However, according to the official government estimate (available at: <http://index.go.kr>; accessed September 17, 2013), there were 2.8 million overseas Korean residents in 2011. The Korean Statistical Information Service of the Korean central government conducts the PHC every 5 years to obtain information regarding the size, distribution, and structure of population and housing in Korea. The PHC was conducted in 2005 and 2010, and the next PHC is scheduled for 2015. The Korean population in 2010 was estimated at 47 990 761 individuals. Detailed demographics of the population are listed in Table 1.

The person-time incidence rates for 2008 through 2011 were calculated as the number of people in whom RVO developed divided by the total person-time at risk during the study period. Therefore, in this analysis, person-years were counted after the incident time. The annual RVO incidence rates were calculated as persons in whom RVO developed divided by the total population, based on the 2010 census. The age- and gender-specific RVO incidence rates were estimated. A 95% confidence interval (CI) of the incidence rate was estimated based on Poisson distribution. The female-to-male ratio for the RVO incidence rate was also calculated. Chi-square analysis was used to compare the observed incidence rates between the genders. The association between RVO incidence and age groups was analyzed by gender-adjusted logistic regression analysis as well as multiple regression analysis. To provide values of the RVO incidences that could be compared with the results of previous cohort studies, we estimated the RVO incidence for the age groups of persons older than 40 years and persons older than 50 years. These analyses also were performed for groups A, B, and C. We used SAS software version 9.3 (SAS Inc., Cary, NC) for all analyses. *P* values less than 0.05 were considered statistically significant.

Results

In total, 92 730 clinically diagnosed RVO cases (56.4% women) were identified during the 4-year study period (2008–2011). The number of RVO cases in 2008, 2009, 2010, and 2011 was 23 586 (25.4%), 22 066 (23.8%), 22 537 (24.3%), and 24 541 (26.5%), respectively.

During the 4-year study period, the RVO incidence rate was 48.31 per 100 000 person-years (95% CI, 48.00–48.62). The 4-year RVO incidence rate in men and women was 42.40 (95% CI, 41.99–42.81) and 54.14 (95% CI, 53.67–54.60) per 100 000 person-years, respectively. The incidence of RVO in women was 1.28 times higher than that in men ($P < 0.001$; Table 1).

The annual RVO incidence rate increased from 2008 to 2010, but declined from 2010 to 2011 ($P < 0.001$, chi-square analysis). Annual incidence rates from 2008 to 2011 are reported in Table 2 (available at <http://aaojournal.org>).

Individuals 70 to 74 years of age had the highest RVO incidence at 214.92 per 100 000 person-years (95% CI,

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