

The Literature

BY JAMES TAN, MD, PhD

LONG-TERM TRENDS IN GLAUCOMA-RELATED BLINDNESS IN OLMSTED COUNTY, MINNESOTA

Malihi M, Filho ERM, Hodge DO, Sit AJ¹

ABSTRACT SUMMARY

It is not clear if the rate of blindness due to glaucoma has changed over time. Malihi et al¹ assessed longitudinal trends in blindness due to open-angle glaucoma (OAG) between 1965 and 2009 in Olmsted County, Minnesota. The investigators analyzed data collected in Olmsted County from 1980 to 2000 as a follow-up to a report by Hattenhauer et al² that characterized OAG-related blindness in the same county between 1965 and 1980.

The retrospective, population-based study included Olmsted County residents who were diagnosed with OAG between January 1, 1965, and December 31, 2000. Data had been collected as part of the Rochester Epidemiology Project, a longitudinal population-based study that has tracked the Olmsted County population over decades. Available medical records of incident OAG cases were reviewed to identify progression to blindness, which was defined as a visual acuity of 20/200 or visual field constriction to 20° or worse. OAG comprised primary OAG (65%), exfoliation glaucoma (14.7%), pigmentary glaucoma (5.7%), or treated ocular hypertension (OHT; 14.6%).

The cumulative probability and population incidence of OAG-related blindness within 10 years of diagnosis were the main outcome measures. The researchers performed a Kaplan-Meier analysis to determine the cumulative probability of OAG-related blindness and used US Census data to calculate the incidence of blindness within 10 years of glaucoma diagnosis. Blindness rates in OAG subjects diagnosed between 1965 and 1980 and between 1981 and 2000 were compared using log-rank tests and Poisson regression models.

The probability of OAG-related blindness in at least one eye 20 years after diagnosis was significantly greater in subjects diagnosed between 1965 and 1980 (25.8%) compared with between 1981 and 2000 (13.5%; $P = .01$). The probability of bilateral blindness was 9% between 1965 and 1980 and 4.3% between 1980 and 2000. The incidence of blindness within 10 years of diagnosis was

significantly higher in subjects diagnosed between 1965 and 1980 (8.7/100,000) compared with between 1981 and 2000 (5.5/100,000; $P = .02$). The risk of progression to blindness was higher in subjects diagnosed at a later age ($P < .001$).

The authors concluded that the 20-year probability and incidence of OAG-related blindness in at least one eye decreased between 1965 and 2009. The authors postulated that declining rates of glaucoma-related blindness over 45 years had been associated with advances in glaucoma diagnosis and therapy. Despite advances, however, a significant proportion of patients still progressed to blindness.

DISCUSSION

A strength of this population-based study is that it was conducted through an integrated medical system that serves the relatively isolated Olmsted County in Minnesota. Residents almost exclusively seek health care through this medical system. Incidence data were available from a large population-based sampling collected over 45 years, providing unique long-term population data on disease occurrence and natural history pertinent to analyzing blindness trends in chronic OAG.

A potential for bias may lie in the fixed follow-up period of 10 years from diagnosis used, which may have influenced the calculation of blindness rates. This is because glaucoma-related blindness is more frequent in older people, and because there has been a trend toward earlier glaucoma diagnosis. The authors found, however, that annual OAG incidence did not change over time, reducing the chance of this bias. A greater percentage of OHT diagnoses were seen between 1965 and 1980 (60.2%) compared with between 1980 and 2000 (14.6%). The investigators claim this may have been due to OHT being reclassified as glaucoma in the latter group, commensurate with an increasing awareness of preperimetric glaucoma over time. To eliminate potential bias, OHT and OAG were combined in each period. Data were collected retrospectively.

These data apply to white patients diagnosed with OAG or hypertension. The risk of bilateral glaucoma blindness in predominantly white patients has been reported in other studies as 6.4% (clinic based, over 15 years)³ and 16% (lifetime).⁴

LIFETIME RISK OF BLINDNESS IN OPEN-ANGLE GLAUCOMA

Peters D, Bengtsson B, Heijl A⁴

ABSTRACT SUMMARY

Peters et al studied the lifetime risk of blindness in patients with manifest OAG and the duration over which blindness from OAG is experienced. This retrospective study included OAG patients (primary OAG or exfoliation glaucoma) who were residents of the city of Malmö catchment area in Sweden (population, 305,000) who died between January 2006 and June 2010. Most glaucoma patients in this area are managed at the Department of Ophthalmology at Skane University Hospital in Malmö. OAG patients were identified through department records and a low vision aid facility, which is the only such facility for the catchment area.

The investigators used the World Health Organization criteria for low vision ($20/400 \leq$ visual acuity $< 20/60$ and/or $10^\circ \leq$ central visual field $< 20^\circ$) and blindness (visual acuity $< 20/400$ and/or central visual field $< 10^\circ$). From this, four classifications emerged: (1) unilateral low vision, or patients with low vision in one eye; (2) bilateral low vision, or patients with low vision in the better-seeing eye; (3) unilateral blindness, or patients blind in one eye; and (4) bilateral blindness, or bilaterally blind patients with blindness in at least one eye caused by glaucoma.

Data from 592 patients were available. The median age at death was 87 years (range, 50-103), the mean duration of OAG diagnosis was 11 years, and the median time between the last visit and death was 8 months (interquartile range, 3-16 months). At the last visit, 42.2% of patients (250/592) were blind due to glaucoma in at least one eye, 16.4% (97/592) were bilaterally blind, and 0.5% had low vision (12/592). Median duration with a glaucoma diagnosis was 12 years (range, < 1 -29). The median age at which bilateral blindness developed was 86 years (range, 66-98), and the median duration of bilateral blindness was 2 years (range, < 1 -13). The cumulative incidence of glaucoma-related blindness after 10 years in at least one eye was 26.5%, and bilaterally it was 5.5%. Blindness incidence after 20 years in at least one eye was 38.1%, and bilaterally it was 13.5%. Of patients initially diagnosed with OAG at Skane University Hospital (71.5%; 40.2% with exfoliation glaucoma), the mean age at OAG diagnosis was 74 years (standard deviation, 7.9 years).

DISCUSSION

The strengths of the study are that it included a large sample size based on health care system records that

widely captured OAG data of residents in the catchment area of Malmö. Last clinic visit attendance on average was within 1 year of death, allowing documentation of vision relatively close to the point of death.

Caveats are that the exact number of Malmö patients with OAG treated outside the academic center was unknown. An overestimate of the blindness rate might have occurred if patients treated elsewhere had milder glaucoma. It might also have limited the extent to which the data fully represented the catchment area. The study was retrospective, with a varying number of follow-up visits, visual field tests, and patients lost to follow-up. A high percentage of OAG patients had exfoliation glaucoma, which carries a higher risk of blindness.^{5,6}

The data apply to white patients with diagnosed glaucoma and documented visual field defects. The great majority of bilaterally blind patients who lost vision in the better eye were older than 80 years. The authors postulate that, with rising age expectancy, glaucoma patients may face an increased lifetime risk of glaucoma-related blindness. The lifetime rate of OAG-related blindness in whites is reported to be as high as 12%^{7,8} with varying sample sizes and follow-up periods. The risk of bilateral blindness in whites has been estimated as 22% after 20 years,² 6.4% after 15 years,³ and 9% (1965-1980) and 4.3% (1980-2000) after 20 years.¹ ■

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