Fluoroquinolones are one of the most commonly prescribed classes of antibiotics. Routinely used for a wide range of clinical indications, they account for more than 32 million U.S. outpatient prescriptions annually. Fluoroquinolones can produce severe systemic adverse effects, including tendinopathy and cardiac arrhythmias. Reported ocular adverse effects include uveitis, iris transillumination, pigment dispersion, optic neuropathy, diplopia, retinal hemorrhage, serous macular detachment and, more recently, retinal detachment (Figure) as reported in the *Journal of the American Medical Association* in 2012.

Andrew J. Barkmeier, M.D., with the Department of Ophthalmology at Mayo Clinic in Rochester, Minn., leads a team that further investigated the potential relationship between these common medications and retinal detachment to determine whether oral fluoroquinolone medications increase the risk of rhegmatogenous retinal detachment and acute symptomatic retinal breaks. “Given the widespread use of fluoroquinolones and the sight-threatening nature of rhegmatogenous retinal detachment, such an association would have significant clinical implications,” says Dr. Barkmeier.

Using records from the Rochester Epidemiology Project (REP) database (Sidebar, see page 3) for a retrospective review, the team identified 38,046 unique patients age 18 or older who were prescribed oral fluoroquinolones in Olmsted County, Minn., between Jan. 1, 2003, and June 30, 2011, as well as all retinal detachment repair and prophylaxis procedures performed within one year of the prescription dates. The team compared these procedure rates with rates identified in cohorts of patients prescribed macrolide and beta-lactam antibiotics during the same time frame. Retinal detachment repair rates were also compared with Olmsted County population-based historical controls from a previous REP study (1976 through 1995).

“A review of charts revealed which patients had truly developed spontaneous rhegmatogenous retinal detachment, as opposed to those who underwent surgical procedures for diabetic tractional retinal detachment, or for retinal detachment associated with trauma or endophthalmitis. We were also able to identify which retinal detachment prophylaxis procedures were performed for acutely symptomatic retinal tears, while excluding treatments for other lesions or for tears of unknown chronicity,” says Dr. Barkmeier.

**No increased risk identified**

Results showed that no rhegmatogenous retinal detachments occurred during the initial fluoroquinolone treatment course for any of the 38,046 study patients. There were no differences in the rate of rhegmatogenous retinal detachment repair or symptomatic retinal break prophylaxis within 7, 30, 90 or 365 days of initial prescription dates for oral fluoroquinolone, macrolide or beta-lactam antibiotics.
Glaucoma is a leading cause of irreversible blindness worldwide. It affects more than 2.7 million individuals age 40 or older in the United States — approximately 1.9 percent of this population. Glaucoma is the second-leading cause of blindness among blacks, after cataract, and the third-leading cause of blindness in whites, after age-related macular degeneration and cataract.

A retrospective study of residents of Olmsted County, Minn., however, shows that the probability of blindness due to open-angle glaucoma (OAG) in at least one eye decreased by nearly 50 percent over a 45-year period from 1965 to 2009. The population’s incidence of blindness within 10 years of diagnosis of OAG also decreased in that time.

“Diagnostic criteria for glaucoma have undergone significant modifications over the last 40 years,” says Arthur J. Sit, M.D., with the Department of Ophthalmology at Mayo Clinic in Rochester, Minn., who led the study team. “New diagnostic and progression analysis tools, as well as new therapies for intraocular pressure (IOP) reduction, continue to be developed and have undoubtedly benefited individual patients. Their effect on the rates of visual impairment in populations, however, is poorly understood.

This longitudinal study will help us gain a better understanding of epidemiologic trends in glaucoma, optimize the distribution of health and medical resources, and provide feedback on the efficacy of novel management approaches on a population basis.”

The team studied a cohort from the Rochester Epidemiology Project (Sidebar, see page 3), which tracks the entire population of Olmsted County over multiple decades. Participants included all county residents age 40 or older who were newly diagnosed with OAG between Jan. 1, 1965, and Dec. 31, 2000. All medical records of every patient with OAG were reviewed to identify progression to blindness (visual acuity of 20/200 or less, or visual field constriction to 20 degrees or less).

“For more information

Incidence and Probability of Progression to Blindness Due to Open-Angle Glaucoma Decreases Dramatically

Andrew J. Barkmeier, M.D.

Dr. Barkmeier presented this research at the annual meeting of the American Academy of Ophthalmology in 2013. The study was published in Ophthalmology online in January 2014.
Results

“Our research shows that the probability of blindness due to OAG in at least one eye and the annual population incidence of OAG-related blindness were both lower for patients diagnosed between 1981 and 2000 compared with patients diagnosed between 1965 and 1980 in the same geographic location,” says Dr. Sit. According to an article published in the January 2014 issue of *Ophthalmology*:

- The probability of glaucoma-related blindness in at least one eye at 20 years decreased from 25.8 percent (95 percent confidence interval, 18.5-32.5) for subjects diagnosed between 1965 and 1980 to 13.5 percent (95 percent confidence interval, 8.8-17.9) for subjects diagnosed between 1981 and 2000 (P = 0.01).
- The population incidence of blindness within 10 years of the diagnosis decreased from 8.7 per 100,000 (95 percent confidence interval, 5.9-11.5) for subjects diagnosed between 1965 and 1980 to 5.5 per 100,000 (95 percent confidence interval, 3.9-7.2) for subjects diagnosed between 1981 and 2000 (P = 0.02).
- Higher age at diagnosis was associated with increased risk of progression to blindness (P < 0.001).

Possible reasons why the probability of OAG-related blindness in Olmsted County may be decreasing include changes in glaucoma management techniques from 1965 to the end of the follow-up period in 2009, including:

- Improvements in medical and surgical therapy
- Development of laser trabeculoplasty, automated perimetry, and optic disk and nerve fiber layer imaging
- A better understanding of glaucoma pathophysiology and the risk factors for progression

“It is also possible that changes in diagnostic criteria for glaucoma have resulted in earlier diagnosis of glaucoma, which could manifest as an increased duration until blindness, and a lower probability of blindness over 20 years,” says Dr. Sit. “In addition, better public awareness may have resulted in a higher diagnosis rate of asymptomatic glaucoma, which would also reduce the risk of progressing to blindness in a fixed time period. The age of first diagnosis has not changed, suggesting that patients are not being diagnosed earlier, but are receiving more effective treatment after diagnosis.

“This reduction in the blindness rate is a testament to the work that has been done by everyone involved in glaucoma research and treatment. Nearly 14 percent of patients still go blind in at least one eye, however, so it is critical that we continue research to improve our knowledge and management of glaucoma and build awareness of the need for routine eye exams to detect this disease at an early stage,” says Dr. Sit.

For more information


Retrospective Study Identifies Incidence and Demographics of New-Onset Strabismus in Adults

Childhood strabismus has been well-characterized by epidemiologic studies worldwide, but published reports of strabismus among adults are uncommon — and almost exclusively institution-based series of patients referred solely for surgical intervention. “Existing reports provide very little data on the true incidence and demographics of strabismus in adults,” says Brian G. Mohney, M.D., with the Department of Ophthalmology at Mayo Clinic in Rochester, Minn. Dr. Mohney led a team that used Rochester Epidemiology Project (Sidebar) data to study the incidence of new-onset strabismus and its types in a geographically defined adult population diagnosed over a 20-year period. Results were published in *Ophthalmology* online in December 2013.

Ocular misalignment among adults differs significantly from pediatric strabismus, a well-characterized disorder. “Nearly 90 percent of children with strabismus are diagnosed by their sixth year of life, two-thirds display an esotropic deviation, many have amblyopia and diplopia is rare,” says Dr. Mohney. “In contrast, new-onset ocular misalignment among adults is significantly associated with increasing age. Esotropia, exotropia and hypertropia occur with similar frequency. Adult-onset strabismus is not associated with amblyopia or decreased vision. Instead, it is more likely to be the result of a paralytic disorder or small but troubling deviations with persistent double vision.”

Adults develop strabismus secondary to a variety of conditions, including trauma, surgical procedures, thyroid dysfunction, cranial nerve palsies and other neurological diseases (Figure, see next page).
1 in 25 adults may develop strabismus

The research team's retrospective study identified 753 cases of new-onset strabismus among residents 19 years or older in Olmsted County, Minn., diagnosed from Jan. 1, 1985, through Dec. 31, 2004, an annual age- and sex-adjusted incidence rate of 54 cases per 100,000 individuals. The four most common types of new-onset strabismus were:

- Paralytic (44 percent of cases)
- Convergence insufficiency (16 percent)
- Small-angle hypertropia (13 percent)
- Divergence insufficiency (11 percent)

"For paralytic strabismus, the association between age and the incidence may be related to the age-dependent increase of diseases such as hypertension and diabetes," says Dr. Mohney. "Paralytic strabismus was also significantly more common in males, due primarily to the higher incidence of fourth nerve palsy. Head trauma is often reported as the most common identifiable cause of fourth nerve palsy, and the reported incidence of closed-head injury is higher in males than females."

The incidence of adult-onset strabismus overall and its four most common forms significantly increased with age, with peak incidence in the eighth decade of life. "There were no significant gender differences or changes in the incidence of adult-onset strabismus over the 20-year study period," says Dr. Mohney. "This trend of increasing incidence with age was seen in each of the major forms of adult-onset strabismus. Based on the age- and gender-adjusted annual incidence rate of 54 cases per 100,000 people, about 1 in 25 adults would be expected to develop strabismus during their lifetime, with a significant higher risk with increasing age."

Extrapolation of the results is limited by the lack of access to records from optometrists practicing in Olmsted County and the racial and ethnic composition of the county, which was 90 percent white during the years of the study. "Recognizing these weaknesses and assuming a population of 209,129,000 individuals 19 years or older, we estimate that approximately 113,000 new cases of adult-onset strabismus will develop each year in the United States. Roughly 50,000 adults will have some form of paralytic strabismus," says Dr. Mohney.

For more information