Prevalence and Risk Factors of Pterygium in a Southwestern Island of Japan: The Kumejima Study

HIROKI SHIROMA, AKIKO HIGA, SHOICHI SAWAGUCHI, AIKO IWASE, ATSUO TOMIDOKORO, SHIRO AMANO, AND MAKOTO ARAIE

• PURPOSE: To determine the prevalence and risk factors for pterygium in a Japanese population aged 40 years or older on Kumejima Island, Japan.
• DESIGN: Cross-sectional, population-based study.
• METHODS: All residents of Kumejima Island, Japan, located in Southwestern Japan (Eastern longitude 126 degrees, 48 feet and Northern latitude 26 degrees, 20 feet), aged 40 years and older were asked to undergo a comprehensive questionnaire and ocular examination.
• RESULTS: Of the 4,632 residents, 3,762 (81.2%) underwent the examination. The presence of pterygium could not be determined in 15 subjects. Of the 3,747 eligible subjects, 1,154 (30.8%; 95% confidence interval [CI], 29.3% to 32.3%) had pterygium in at least 1 eye and 491 subjects (13.1%; 95% CI, 12.1% to 14.3%) had pterygium in both eyes. In the logistic regression analysis, older age ($P < .001$), male gender ($P = .024$), hyperopic refraction ($P = .001$), lower intraocular pressure ($P = .002$), and outdoor job experience ($P < .001$) were independently associated with a higher risk of pterygium.
• CONCLUSION: The prevalence of pterygium is 30.8% among adult Japanese aged 40 years and older in Kumejima. Older age, male gender, hyperopic refraction, lower intraocular pressure, and outdoor job history were independently associated with a higher risk of pterygium. (Am J Ophthalmol 2009;148:766–771. © 2009 by Elsevier Inc. All rights reserved.)

PTERYGIUM IS AN ABNORMAL FIBROVASCULAR TISsue that develops from the conjunctiva into the cornea. In advanced cases, pterygium decreases visual function secondary to loss of corneal transparency within the pupillary area and increases irregular corneal astigmatism. Pterygium is most likely related to ultraviolet radiation[1,2] and other environmental factors such as heat, dust, and a dry atmosphere.[3] The proposed causative mechanisms include alterations of the limbal stem cells[4] or conjunctival fibroblasts[5] resulting from chronic ultraviolet light exposure and altered expression of p53,[6,7] tissue growth factor-β,[8] and matrix metalloproteinases.[9,10] The definitive causative mechanisms, however, are not known.

Several population-based studies[11–20] have examined the prevalence of pterygium and indicate that the prevalence ranges from 1.2% in a White population in urban Australia[20] to 33.0% in a Chinese population aged 50 years or older of Doumen County, Southern China.[13] In general, there is a higher prevalence of pterygium in rural regions than in urban regions.[11–20] In Japan, a large population-based study of the rate of pterygium has not yet been performed. The present population-based study on the prevalence of pterygium in Japan was performed on Kumejima Island. Although Kumejima Island is located in the Southernmost region of Japan, it possesses several socioeconomic factors that are common in the population living in the rural area in Japan, such as higher ratio of elderly people and outdoor workers, lower income level, and limited access to medical facilities. Moreover, risk factors for pterygium formation are likely to be elucidated by studies of populations with a high prevalence of pterygium, which is more likely in a rural region than in an urban region. For these reasons, the population in Kumejima Island was selected as a study subject in the present study.

SUBJECTS AND METHODS

• STUDY POPULATION: The prevalence of pterygium was examined as part of a population-based epidemiologic survey on ocular diseases in residents of Kumejima Island aged 40 years or older. Kumejima is a 63.2-km^2 island located in the Southwestern part of Japan (Eastern longitude of 126 degrees, 48 feet and Northern latitude of 26 degrees, 20 feet) west of the main island of Okinawa and has a population size of approximately 9,000, with most residents originating from the Okinawa prefecture. The weather is warm and humid, with average daily temperatures of 22.7 C and yearly total rainfall of 2138 mm. This study was conducted between May 1, 2005 and August 31, 2006. According to the official household registration database, Kumejima had 5,249 residents aged 40 years or older in 2005. After excluding residents who died, moved, or could not be located in Kumejima during the study period (n = 617), 4,632 residents were eligible for the study. All of these residents were asked by letter and telephone to

Accepted for publication Jun 2, 2009.
From the Department of Ophthalmology, University of the Ryukyus Faculty of Medicine, Okinawa, Japan (H.S., A.H., S.S.); the Department of Ophthalmology, Tajimi Municipal Hospital, Tajimi, Japan (A.I.); and the Department of Ophthalmology, University of Tokyo Graduate School of Medicine, Tokyo, Japan (A.T., S.A., M.A.).
Inquiries to Shiro Amano, 7-3-1 Hongo, Bunkyo-ku, Tokyo, 113-8655 Japan; e-mail: amanos-tky@umin.ac.jp

0002-9394/09/$36.00
doi:10.1016/j.ajo.2009.06.006

TABLE 1. Locations of Pterygium in 3,740 Right and 3,743 Left Eligible Eyes in Kumejima Study[a]

	Right Eyes (n = 3,740)	Left Eyes (n = 3,743)	Total (n = 7,483)
Nasal only	773 (20.7%, 19.4% to 22.0%)	747 (20.0%, 18.7% to 21.3%)	1,520 (20.3%, 19.4% to 21.2%)
Temporal only	22 (0.6%, 0.4% to 0.9%)	24 (0.6%, 0.4% to 1.0%)	46 (0.6%, 0.5% to 0.8%)
Nasal and temporal	32 (0.9%, 0.6% to 1.2%)	31 (0.8%, 0.6% to 1.2%)	63 (0.8%, 0.7% to 1.1%)
Uncertain[b]	7 (0.2%, 0.1% to 0.4%)	9 (0.2%, 0.1% to 0.5%)	16 (0.2%, 0.1% to 0.3%)
Total	834 (22.3%, 21.0% to 23.7%)	811 (21.7%, 20.4% to 23.0%)	1,645 (22.0%, 21.1% to 22.9%)

[a]Numbers of eyes are shown with prevalence, and the 95% confidence interval is shown in parentheses.
[b]Location of pterygium was uncertain in eyes after removal of pterygium.

TABLE 2. Gender- and Age-Specific Prevalence of Subject With Pterygium in at Least One Eye in Kumejima Study

Age Group (Years)	Men	Women	P^a
40 to 49	110/489 (22.5%, 18.8% to 26.2%)	86/460 (18.7%, 15.1% to 22.3%)	.1485
50 to 59	137/499 (27.5%, 23.7% to 31.5%)	61/359 (17.0%, 13.5% to 21.2%)	<.001
60 to 69	131/321 (40.8%, 35.4% to 46.2%)	113/317 (35.6%, 30.6% to 41.1%)	.1797
70 to 79	160/367 (43.6%, 38.5% to 48.7%)	195/503 (38.8%, 34.5% to 43.0%)	.1523
80+	64/149 (43.0%, 35.3% to 51.0%)	97/283 (34.3%, 29.0% to 40.0%)	.0762
Total	602/1825 (33.0%, 30.8% to 35.1%)	552/1922 (28.7%, 26.7% to 30.7%)	.0047

[a]*P* value between men and women by χ^2 test.

undergo the examinations held at the public hospital of Kumejima. Home visits and examinations were performed for inpatient, paralyzed, and disabled residents.

• **EXAMINATIONS:** All participants provided written informed consent prior to the examinations. After body weight, height, and brachial blood pressure (BP) measurements were obtained, a structured questionnaire was administered that included questions about occupation, health history, surgery and trauma history, smoking habit, history of outdoor work (hours per day and year length), and use of hats and sunglasses. Occupation was categorized into 6 groups: farming, fishing, service, office work, housewife, and others.

A detailed screening ophthalmic examination was performed by experienced examiners and ophthalmologists (H.S., A.H., S.S.), and included uncorrected and best-corrected visual acuity, refraction, slit-lamp examination of the anterior segment, intraocular pressure (IOP), central corneal thickness (CCT), anterior chamber depth, axial length of the eye, Schirmer test, ophthalmoscopy, photography of ocular fundus, and visual field. Refraction was measured using an autorefractometer (ARK-730; Topcon, Tokyo, Japan). IOP was measured 3 times using a Goldmann applanation tonometer under topical anesthesia and the median value was adopted. CCT was measured with specular microscopy (SP-2000; Topcon). Anterior chamber depth and axial length of eye were measured with the IOL Master (Carl Zeiss Meditec, Dublin, California, USA). The Schirmer I test was performed without topical anesthesia. Digital color fundus photographs (30 degrees and 45 degrees) were taken using a nonmydriatic ocular fundus camera system (Image Net TRC-NW7; Topcon). In the screening examination, examinations that did not require direct eye contact, including tests of refraction, visual acuity, specular microscopy, IOL Master, fundus photography, and slit-lamp examination, were performed first. IOP measurement was performed last.

When participants could not visit the hospital, ophthalmologists visited their homes and performed the examinations, including the slit-lamp examination with a hand-held slit-lamp (SL-15; Kowa Co, Tokyo, Japan), IOP measurements with a Perkins tonometer (JFC sales plan, Tokyo, Japan) or hand-held tonometer (Tonopen XL; Bio-Rad Laboratories, Hercules, California, USA), and indirect and direct ophthalmoscopy (BS-II and BXα-13; Neitz Instruments Co, Tokyo, Japan).

Based on the results of the screening examinations, eyes were diagnosed with pterygium when a radially oriented fibrovascular lesion growing over the limbus into the cornea was observed upon slit-lamp examination. Eyes that had a history of pterygium excision were also diagnosed with pterygium. Eyes with an atypical shape and invading tissue, symblepharon and conjunctival scar tissue, and history of ocular trauma were diagnosed with pseudopterygium and were not included among the eyes with pterygium.