Pingueculae and Pterygia in Motorcycle Policemen

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Abstract: [Purpose] Pinguecula and pterygium are speculated to be associated with corneal and conjunctival microtrauma from exposure to sunlight and/or dust. Occupational motorcycle driving is suspected to be associated with such exposure, so we investigated the prevalence of pingueculae and pterygia in motorcycle policemen. [Method] Slit lamp finding obtained by periodic eye checkup for policemen (783 motorcycle policemen and 207 control indoor workers) together with questionnaire were used for analyses. All pingueculae and pterygia were diagnosed under the definite criteria. [Results] The overall prevalence of pingueculae was 590/1,566 eyes (37.7%) among motorcycle policemen against 127/414 eyes (30.6%) among the indoor workers (p<0.01). Besides, with increasing age, the prevalence of pingueculae in the motorcycle policemen clearly exceeded those among the indoor controls. The prevalence of pterygia were very small to be analysed. [Conclusion] Our results exhibited a significant relationship between occupational motorcycle driving and the prevalence of pingueculae. Thus it is strongly suggested that they should wear eye protection equipments (goggles, face shield and so on) to prevent from developing these lesions.

Key words: Pingueculae, Pterygia, Motorcycle driving, Ultraviolet radiation, Eye protection equipments

Introduction

Pinguecula is a fibrous, fleshy degenerative thickening of the bulbar conjunctiva within the palpebral aperture. Pterygium is a hyperplasia of the bulbar conjunctiva growing over the cornea. Though pinguecula is usually asymptomatic, it occasionally causes pingueculitis with the patient experiencing symptoms of local inflammation, such as foreign body sensation, heavy sensation or dry sensation of the affected area. On the other hand, pterygium might grow progressively causing blindness in some instances, and it is often managed by many therapeutic options including incision, cauterization and irradiation.

Both of these conditions are reported to be associated with corneal and conjunctival microtrauma from exposure to sunlight (especially ultraviolet [UV] radiation). Particulate material such as smoke, sand or dust particles is also speculated to be the possible pathogenic factor of both these lesions; therefore it is speculated by many researchers that pingueculae might be the precursors of pterygia.

In addition, both of these disorders occur more commonly in tropical or sunny areas than in more temperate regions such as Japan. The cause is ascribed to differences in the degree of sun exposure. Therefore, in Japan, these disorders have been described as being linked to unique working environments that are exposed to excess UV radiation, dust particles and other possible pathogenic factors. The high incidence of these disorders in Japanese welders has been reported.

Occupational motorcycle driving is another such occupational category that is associated with excessive exposure to both UV and dust particles. Without eye protection equipment, workers might develop pingueculae and pterygia on their anterior segments (cornea and conjunctiva). We investigated one group that drive motorcycles every day as their job: motorcycle policemen.
Here we report the relationship between motorcycle driving and the risk of developing pingueculae and pterygia, and the difference in the prevalence of the two conditions as compared to indoor workers (controls).

Subjects and Method

Study subjects

The target subjects in this study were motorcycle policemen (N=783; 1,566 eyes) in the Tokyo Metropolitan Police Department (MPD) aged 22–49 y (Average 34.5 y; Median 32.4 y) who attended a periodical eye checkup. The controls were 207 male MPD workers in the Section of Criminal Identification (SCI) in the same age bracket (Average 37.5 y; Median 36.3 y).

Ophthalmic examinations

In MPD, at the start of the job and at annual intervals all motorcycle policemen and workers whose job places much strain on the small muscles of the eye (for example: work with visual display terminals) are required to have an eye examination by a qualified ophthalmologist to help identify and correct any pre-existing eye problems that might aggravate discomfort or cause long-term deterioration in eyesight and to pick up any eye problems caused by their jobs.

The examination for drivers consists of a visual acuity test at 5 m, dynamic visual acuity test, slit lamp examination of anterior segment, fundus photography, autorefractometry and tonometry. On the other hand, that for SCI workers consists of a visual acuity test at 5 m, 50 cm, 33 cm; accommodation near point assessment; slit lamp examination of anterior segment; fundus photography; autorefractometry; and tonometry.

In this study we analyzed the slit lamp finding in this periodic eye examination. Ophthalmologists who engaged in the examination were indicated to check all pingueculae and pterygia according to the definite recording system.

Pingueculal/pterygium recording

All pingueculae were recorded when the characteristic fleshy lesions in the bulbar conjunctivae (≥ 0.2 mm in diameter along the palpebral fissure) were disclosed by slit lamp examination with x 10 magnification. Pterygia were also diagnosed by slit lamp examination by the characteristic raised fleshy growth that crossed the limbus and encroached on clear cornea.

Questionnaire

Demographic data and subjective complaints were collected by a questionnaire administered by trained public health nurses. Subjective ratings about the length of their employment (years) as motorcycle policemen, driving distance per year, use of eye protection equipment (sunglasses/spectacles, contact lenses, goggles or nothing) and past history of ocular diseases and injuries such as foreign body in cornea were also included.

Statistical analyses

Comparing the prevalence of pinguecula or pterygium between SCI workers and motorcycle policemen, the chi-square test (p<0.05 was regarded as significant) was done, then multivariate analysis was evaluated. To calculate the estimated relative risk of the prevalence for pinguecula or pterygium of motorcycle policemen, unconditional logistic model was applied with SCI workers as control. The indices for the amount of outdoor exposure are expressed as 1) the length or duration of driving experience (years) or 2) the Exposure Index (EI) that are calculated as the duration of driving experience multiplied with the one-year driving distance (km · years). EI was log-transformed to adjust its distribution as the variable in the multivariate analysis. Multivariate analysis was done with proc logistic of Statistical Analysis for Science (SAS Institute, Cary, North Carolina, USA). To select the statistically significant variable, stepwise method was additionally done on the unconditional logistic model.

Result

The overall prevalence of pingueculae was 590/1,566 eyes (37.7%) among motorcycle policemen against 127/414 eyes (30.6%) among the MPD workers in the Section of Criminal Identification (SCI) (p<0.01). Pterygia were found in 10 eyes of motorcycle policemen but in none of the eyes of the workers in SCI (though the difference was not significant).

The prevalence of pingueculae according to age stratified by 5 years is shown in Table 1 and Figure 1. With increasing age, the prevalence of pingueculae in the motorcycle policemen clearly exceeds those among the workers in SCI. The prevalence of pingueculae according to the length of the working period (experience expressed by years) as motorcycle policemen is shown in Table 2. It is also evident that the prevalence of pingueculae among motorcycle policemen increases according to the length of the experience.
The multivariate regression analysis exhibited that both driving experience and estimated cumulative driving distance expressed as El were significantly related to the prevalence of pingueculae. The estimated relative risk (RR) for driving a motorcycle as compared with indoor work (criminal identification SCI) was 2.04 (95 percent confidence interval (CI); 1.68 to 2.45) by 10 years and that for El was 2.09 (95 percent CI; 1.74 to 2.51) by 10,000 km, respectively, indicating that the risk for those who drove a motorcycle as their occupation was many times greater than that for who work indoors according to the experience (years) and driving distance (km). Both results of the age-duration (length of experience) model and the age-El model are shown on Table 3.

The use of eye protection equipment is shown in Table 4. As shown here, most of the motorcycle policemen do not wear goggles (box type and/or cup type), UVR-blocking face shields, spectacles with side-shield or contact lenses. They wear, if anything, sunglasses or spectacles without refractive power to avoid glare or foreign bodies plunging into the eyes.

### Discussion

Of course this is only a cross-sectional study, and might yield many biases, including selecting the EI as an exposure index.

Anyway, this study exhibits a significant relationship
between occupational motorcycle driving and prevalence of pingueculae. Not only was the prevalence of pingueculae higher among motorcycle policemen than among the workers in the Section of Criminal Identification (SCI), but also the prevalence increased according to the length of the working period and driving distances as motorcycle policemen. Thus, driving motorcycle as an occupation can be concluded to be associated with an increased risk of ocular lesions such as pinguecula just like the case of welders.

The control in this study, the workers in SCI, work with visual display terminals (VDTs), investigate fingerprints and many other detailed printed or photographed materials, thereby placing intensive strain on their eyes. In fact, their subjective complaint rate regarding eye strain or deterioration in visual acuity was higher than that of the motorcycle policemen (data not shown here). However, the SCI workers work mainly indoors and they are rarely exposed to extremes of climate or UV radiation from the sun on the job.

On the other hand, motorcycle policemen are classified as outdoor workers and tend to be exposed to solar UV radiation as well as dust particles. Both pinguecula and pterygium are said to be brought about by such ambient factors (exposure to sunlight, especially ultraviolet [UV] radiation as well as dust particles). It is difficult to determine the exact amount of exposure of eye from solar UV radiation because many unknown variables may exist. One attempt estimated that the cornea is exposed to an effective irradiance of global solar UV of 0.03 to 0.5 µW/cm² at noonday when the sun is at its zenith. The motorcycle policemen spend an average of 8.1 hr/day in the sunlight while on the job and 5.0 h/day during off-days (data not shown), and thereby can be exposed to sufficient UV in sunlight to cause ocular problems.

In the present study, the prevalence of pterygium was low and we could not confirm a relationship between motorcycle driving and its prevalence; however, the prevalence of pinguecula was significantly high as described above. Pterygium is believed by many researchers to develop from a pinguecula, and this view is supported not only by their histological structures, both consisting of hyaline connective tissue subjected to elastoid degeneration but also the raised prevalence of both lesions in areas with much UV radiation. Pterygium often grows progressively and causes blindness in some occasions. Moreover, though pinguecula is usually asymptomatic, it occasionally causes symptoms of local inflammation by itself. Therefore, preventive measures should be set for motorcycle policemen to avoid various ocular ailments due to pingueculae, and keep them efficient on the job.

The simplest device to avoid such problems is to wear eye protection equipment such as UV barrier goggles (box or cup type), spectacles with side shields or ultraviolet-radiation filtering soft contact lenses. However, as shown in Table 4, of 783 motorcycle policemen in MPD, only 18 persons were found to wear such equipment. 702 examinees did wear eyeglasses; but, as mentioned above, they were only ordinary "sunglasses" to avoid glare or spectacles without refractive power to avoid foreign bodies' plunging into the eyes.

In Japan, ordinary sunglasses can only cut a certain range of visible light and have no property to protect from the UV which reaches the eye through the sides, therefore these glasses cannot protect their eyes against scattered, reflected UV and small particles adequately. There exists a regulation in Japan that workers who engage in works involving ultraviolet or infrared ray radiation should wear glasses with a definite shielding property; however, in order to purchase such a kind of sunglasses, one must ask opticians that he/she would like to wear JIS [=Japanese Industrial Standard]-proved UV shielding eyeglasses. Such protective glasses also cost much. In our study, only 2 persons wore such glasses. And MPD itself does not demand motorcycle policemen to wear such a kind of eye protecting equipments. It is therefore strongly recommended that efforts be made to help them to recognize the potential hazards of driving a motorcycle as an occupation and to teach them to wear eye protection equipment to prevent the development of pingueculae, pterygia and other lesions on their anterior segment (cornea and conjunctiva).

References

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