Optical Consequences of Korean Craniofacial Features

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This review of the Korean eye anatomy suggests that there may be unsuspected links between anatomical characteristics of the eye and orbit, and optical performance.

Key words: Anatomy, optics, refractive error, eye

I Introduction

The optics of the human eye can have unsuspected relationships with the anatomy of the face and skull.However, little is known of the differences between craniofacial features in Asians such as Koreans, and with other ethnic groups(mainly whites)[1]. and the potential influence or ocular optics. On the other hand, Garcia and cofound that high degrees of eyelid slant were associated with a higher risk of high astigmatism[2].

Also usually the high myopia is known to be co-existent with corneal astigmatism[3]. Hence, the craniofacial anatomy and ocular optics is associated with a ocular reflection effects.

The purpose of our study is to research the optical consequences of Korean Craniofacill with the medline and EMBASE online database.

II Methods

The medline and EMBASE online databases were used to search for published articles on Asian and Korean craniofacial anatomy and ocular Optics.

III Results and Discussion

The Asian palpebral fissure has a greater obliquity than whites. In a Brazilian study, Hanada et al.[1] found that Japanese subjects had a mean fissure angle of 9.4 3.0 compared with 4.6 2.4 in whites. Garcia and coworkers found that high degrees of eyelid slant greater then 8 were associated with a higher risk of high astigmatism (cylinder > 3.00 DC)[2]. High myopia is known to be co-existent with corneal astigmatism[3]. An American study of children with congenital myopia found that over 50% had corneal astigmatism of 2 D or more. This raises the interesting possibility of whether

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the cornea of the myopic Asian eye is more prone to astigmatic development.

The human eye is more exposed than that of other animals[4]. This may increase the likelihood of diseases in the anterior human eye whichare related to sun exposure. The protrusion of the corneal apex in 89 randomly selected healthy Asians (mean age 52 years, range 19-90 years) was measured by Erb et al.[5] using Hertel exophthalmometry. The authors found a mean measurement of 14.4 2.5 mm (range 8 to 20 mm). The upper normal limit of was 19.4 mm is approximately 2 mm lower than the upper normal limit in Caucasians. The corneal protrusion is lower in the younger Asian eye. In a study of 116 Korean subjects using computerized tomography, Kim and Choi[6] found that between ages 8-13 years and 20 years the corneal protrusion increased from 13.49 mm to 15.03 mm[6]. A study of 2384 Hong Kong Chinese babies found that the palpebral fissure length was larger than measurements reported for white American neonates [7]. Exposure of the eye maybe more important for the younger patient.

The Asian orbit has a more symmetric opening compared with the Caucasian skull[8]. A study of thirty-three Hong Kong subjects (aged 19-42 years) reported an orbital volume of 20.9 cm3, smaller than Caucasian measurements[9]. This was reached by the age of 16 years[10]. The Hong Kong study also found that in the myopic eye, the vitreous chamber remained spherical for errors of up to -12 D[9]. In the Korean skull, the optic nerve foramen is a greater distance from the lateral orbital wall than reported in Indians[11]. The posterior pole of the Korean eyeball was found to be 11.1 1.8 mm behind the interzygomatic line, compared with 9.4 to 9.9 mm reported in American and Turkish subjects[12]. These differences may affect the exposure of the eyeball to sunlight. More research is required to ascertain the effect, if any, of these anatomical differences on sunlight-related eye diseases in Koreans.

The convexity of the peripheral human cornea has unexpected optical consequences. Light that is incident on the temporal corneal limbus can be converged by the convex corneal surface across the anterior chamber to focal sites in the opposite (nasal) side of the same eyeball[13-15]. it has been shown using ray tracing analysis that focal spots of light can be formed from sunlight in the nasal human corneal limbus[15]. and the nasal crystalline lens[16]. The magnitude of the increased light intensity can reach one log unit or more. leading to the hypothesis that such light effects could contribute to corneal disease and cataract formation in the human eye[15-16]. Little data is available on the peripheral dioptric power in the Korean cornea but theoretical analyses indicate that the focusing effect is higher with a steeper and more spherical cornea[16].

IV Conclusions

In conclusion, the optics in the Korean eye may be affected by anatomical factors that have previously received little attention, such as skull shape, eyeball exposure, and peripheral corneal power. More research is indicated on Korean subjects to ascertain whether there are any links between anatomy and optical performance of the eye.

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