Strabismus

Are there more exotropes than esotropes in Hong Kong?

S R Lambert

Yes, but are Asian children more likely to be exotropic than white children?

It is well known that there are marked differences in the prevalence of certain ocular disorders among various ethnic groups. These differences probably reflect the unique genetic make-up of these ethnic groups coupled with a variety of environmental influences. Ethnic variations are particularly marked for the prevalence of myopia and hyperopia. While population based studies from the United States[1 2] and Australia[3 4] have reported a prevalence of myopia ranging from 15–26% in adults, the prevalence has been reported to be significantly higher in Singapore (35%).[5] Asian countries in particular have also been experiencing a dramatic increase in the prevalence of myopia. For example, 82% of all ethnic Chinese Singapore military recruits screened between July 1996 and June 1997 were myopic.[6]

In this issue of the *BJO* (p 854), Yu and coworkers report that the incidence of exotropia is twice as common as esotropia in the strabismus clinic at the Hong Kong Eye Hospital, whereas studies based in Europe and North America have reported a much higher percentage of esotropes than exotropes. In addition, Yu and coworkers report that the ratio of exotropia/esotropia in Hong Kong has increased dramatically over the past decade. How can these differences be explained?

Firstly, the increased incidence of exotropia in Hong Kong may reflect a difference in the prevalence of certain refractive errors among Chinese children that are risk factors for the development of various types of strabismus. The Refractive Error Study in Children, a population based study sponsored by the World Health Organization, elucidated some important differences between the refractive errors of Asian and white children.[7–10] The study compared the prevalence of refractive errors among children 5–15 years of age in China, Nepal, and Chile. Interestingly, the prevalence of myopia did not differ markedly between 5 year olds in these countries (China <1%; Nepal <2%; Chile 3.5%); however, the prevalence of myopia was much higher in Chinese 15 year olds (males 36.7%; females 55.0%) compared to 15 year olds in Nepal (males 2%; females 1%) and Chile (males 20%; females 15%). Conversely, the incidence of moderate or high hyperopia (>2 D) in children 5–7 years of age was much higher in Chile (Nepal 1.1%; China 8.5%; Chile 21.6%). The higher percentage of moderate and high hyperopes in Chile would suggest that white populations are more likely to be hyperopic than Asian populations. Since a close linkage between accommodative esotropia and hyperopia has been established,[11–13] it is not surprising that a higher percentage of white than Asian patients would become esotropic, particularly since the majority of esotropic children have accommodative esotropia.[14] It is less clear if the increasing incidence of myopia in Asian children can account for the increasing ratio of exotropes to esotropes in Hong Kong.

> Esotropia is probably higher in white than in Asian children because white children are more likely to be moderate or high hyperopes

While a linkage between myopia and intermittent exotropia in children may exist, the linkage is largely inferential. Kushner[15] reported a mean initial refractive error of 0.0 (SD 1.40) D in a group of children with intermittent exotropia when 4.4 years of age, whereas 4 year old non-strabismic children in Boston had a mean refractive error of +1.13 (0.85) D, and 5 year old children in Chile a mean refractive error of +1.3 D.[10 16] In addition to being less hyperopic when initially diagnosed, intermittent exotropes tend to become more myopic over time compared to age matched controls. After a 5 year follow up, the intermittent exotropes in Kushner's[15] study had a mean refractive error of –1.40 (2.80) D and after a 10 year follow up a mean refractive error of –2.41 (2.20) D, whereas boys in Chile had a mean refractive error of +1.1 D when 10 years of age and +0.2 D when 15 years of age.[10] Since most children with intermittent exotropia became symptomatic by the age of 5 years, the low incidence of myopia even in Chinese children when 5 years of age, would argue against the increasing incidence of myopia in older children being a significant factor accounting for the increasing incidence of exotropia in Hong Kong. More likely, a decreasing incidence of moderate or high hyperopic refractive errors has resulted in fewer patients developing accommodative esotropia, thereby increasing the ratio of exotropes to esotropes. This may also explain why Yu and coworkers found an increasing proportion of non-accommodative to accommodative esotropes in Hong Kong over the past decade.

A second possible factor to explain the higher ratio of exotropes to esotropes in Hong Kong relative to the North American and European studies cited may be the demographics of the patients studied. Yu and coworkers included in their study all patients 19 years of age or younger presenting to their clinic with strabismus, whereas the studies cited from North America and Europe included only patients who were 7 years of age or younger.[17–21] Since two of the most common types of esotropia (accommodative and infantile) almost never present after the age of 7 years, whereas both intermittent and sensory exotropia may develop in older children, there would be an inherent bias in Yu's study to have an increased ratio of exotropes to esotropes. However, it seems unlikely that this can fully account for the high ratio of exotropes to esotropes in Yu's study since Ing and Pang[22] have reported an increased prevalence of exotropes compared to esotropes in Asian children 7 years of age or younger.[22]

In conclusion, esotropia is probably higher in white than in Asian children because white children are more likely to be moderate or high hyperopes. It is less clear if the prevalence of exotropia is more common in Asian than in white children. Careful population based studies would be the best means of elucidating true differences in the prevalence of different forms of strabismus among Asian and white children. While the recently completed Refractive Error Study in Children included an ocular motility evaluation, only cursory data are provided which do not allow a meaningful comparison to be made between Asian and white children.[7–10] So are there more exotropes than esotropes in Hong Kong? Yes. But are Asian children more likely to be exotropic than white children? We'll have to wait to find out.

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Glaucoma

A few remarks about glaucoma

A Wegner

New incidence and prevalence studies required

Weber designed the first applanation tonometer in 1867, Goldmann constructed the modern applanation tonometer in 1954, but only 27 years ago Ehlers *et al*[1] presented their study that showed the correlation between central corneal thickness (CCT) and intraocular pressure (IOP) applanation tonometric measurement. The number of publications about central corneal thickness measurements has risen exponentially over the past few years,[2] but do we use this information? The implementation of this inverse correlation between CCT and IOP on the glaucoma/ocular hypertension (OHT) patients has a great impact on our knowledge, understanding, classification, and treatment of glaucoma. This means that many OHT patients should be reclassified as normal; from 30% as Argus[3] found or even up to 65% according to Herndon *et al*.[4] Of the normal tension glaucoma (NTG) patients a similar proportion can be reclassified; 31% according to Copt *et al*.[5] But this is only the beginning. All the data concerning prevalence of OHT, NTG, and primary open angle glaucoma (POAG) must be revised as well as all the data concerning natural history and typical morphological changes of OHT and NTG. One of the most important consequences should be that corneal pachymetry is a must when conducting a study with OHT or NTG patients, otherwise the population study is false and the results are not valid. Nevertheless, most publications dealing with OHT and NTG patients do not put these criteria to use, and we continue to gather inaccurate information. The Ocular Hypertension Treatment Study[6] has to readjust its eligibility assessment—include CCT pachymetry—otherwise the results of this important study will be doubted.

Visual field examination and interpretation is one of the pillars of ophthalmological diagnoses. Bengtsson *et al*[7] introduced in 1997 the Swedish interactive threshold algorithm (SITA), a static perimetry operating system/software package. SITA standard presents a reduced number of stimuli by an average of 25% and test time reduction up to 50%.[7–9] SITA has greater patient acceptance than full threshold strategy.[10 11] The mean sensitivity is about 1 dB higher than in a full threshold program and the age dependent decrease of mean sensitivity is 25% smaller.[12 13] The intersubject variance is 30% smaller.[9 13] In glaucoma patients the SITA standard shows a larger number of significantly depressed points.[14] Perimetry is still the gold standard for most ophthalmologists for glaucoma monitoring. Should we be satisfied with a blurred presentation of visual field instead of a clear and sharp presentation only because of greater patient acceptance? All the deviations of sensitivity in comparison with full threshold strategy are the result of the algorithm behind SITA, as well as the lower intersubject variance that is flattened by an algorithm, and not because of shorter examination time. It can be deduced, if we look at a similar strategy, that tendency oriented perimetry (TOP), has similar drawbacks.[15 16]

> What we are measuring is the ability of a method to detect the patients who were classified as having glaucoma with another method . . . but not the overall ability to detect the pathology

In the Hippocratic aphorisms the term glaucoma is first mentioned as a diagnosis. But, still there is no agreement over the definition of glaucoma or what are the criteria to diagnose glaucoma. A review of 182 articles about POAG published in 1980, 1985, 1990, and 1995 in the *American Journal of Ophthalmology*, *Ophthalmology*, and *Archives of Ophthalmology* showed that only 66% included a definition of POAG.[17] Among these, there are various combinations of optic disc visual field criteria and IOP to define

POAG. In the population based Rotterdam Study, different commonly used criteria for the diagnosis of POAG resulted in prevalence figures ranging from 0.1% to 1.2%.[18] Millions of people all over the world are treated for glaucoma—in the United States more than one million. Bohn *et al*[19] have shown that in almost half (44.7%) of 544 patients who were treated for POAG, the only parameter used for diagnosis was IOP. As long as there are no accepted criteria for glaucoma diagnosis the correct time for first medical intervention is unclear and studies are difficult to compare. The same problem arises as we try to compare various screening methods and calculate their sensitivity and specificity. Furthermore, no method can detect all glaucoma cases.[20–23] The sensitivity and specificity is falsified, as some people who have glaucoma and who are detected with one method will not be detected by another method and vice versa. Actually, what we are measuring is the ability of a method to detect the patients who were classified as having glaucoma with another method, which is inaccurate in itself, but not the overall ability to detect the pathology. To minimise those problems a classification and definition system should be agreed upon.

A final remark, over the years it has been suggested that the new diagnostic tools enable us to detect glaucoma much earlier. Is it not time to implement these methods and to do new population based incidence and prevalence studies of glaucoma with the new diagnostic devices? I would expect a shift to the left of the age distribution. Glaucoma is ready for an update.

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