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Detection of Socially Significant Strabismus in an Ethnically Diverse Model Set

Stacy L. Pineles, MD

Jules Stein Eye Institute, Department of Ophthalmology, University of California, Los Angeles

Strabismus is a common ocular disorder in patients of all ages. As the population grows older, strabismus is likely to present an even bigger burden given that its incidence in adults increases with age. In our current health care model, defining desirable surgical outcomes is becoming increasingly important. Quality measures are being delineated, and the way that we judge surgical success is also in evolution. Given that strabismus surgery is on the rise in the United States, it is important to begin to accrue quantitative but patient-oriented measures by which to determine acceptable outcomes. Although functional outcomes should be prioritized, the psychosocial aspects of adult strabismus are also crucial to understand and address with our patients.

As early as 1943, Lion et al¹ wrote on the topic of strabismus and its adverse effects on children's personalities. However, the first major research study evaluating the psychosocial aspects of strabismus was performed by Satterfield et al in 1993.² This study brought to light the true psychosocial effects of strabismus, reporting that strabismus causes negative effects on self-image, securing employment, interpersonal relationships, school, work, and sports. These negative effects intensified as the study participants grew older. This study confirmed the long-standing beliefs of strabismus surgeons: that the correction of strabismus may confer a benefit to psychosocial functioning and quality of life in these patients. Later work has demonstrated that strabismus is associated with higher rates of mental health problems,³ clinical depression and anxiety, and difficulty finding employment.⁴ Strabismus surgery and ocular realignment appear to improve quality of life in these patients.⁵

In this issue of *JAMA Ophthalmology*, Chan and colleagues⁶ evaluate the threshold for significant strabismus in an ethnically diverse set of models. Using photographs altered via software, they surveyed 120 non-health care professionals and found a 70% threshold for the value at which simulated strabismus became detectable in models of white, black, and Asian descent. Their findings suggested that there are differences in the threshold of esotropia and exotropia detection for each ethnic group. This work is important for several reasons. First, this study is original in that it is the first investigation into ethnic differences in the minimum detectable angle of strabismus. Second, it provides quantitative data for patients and physicians to use when determining cosmetic acceptability of ocular alignment. Finally, the data corroborate the idea that ethnic diversity is crucial in most research studies

Corresponding Author: Stacy L. Pineles, MD, Jules Stein Eye Institute, Department of Ophthalmology, University of California, Los Angeles, 100 Stein Plaza, Los Angeles, CA 90095 (pineles@jsei.ucla.edu).

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to avoid bias. The generalizability of this study is somewhat limited in that the ethnic and socioeconomic backgrounds of the survey respondents are not defined. As the authors point out, it is possible that an Asian observer may be less likely to characterize pseudostrabismus in an Asian model. Given that all the survey respondents were local to the Boston area, it is also unclear how observers in different geographical areas would respond. In addition, although 3 different ethnic groups were studied, the concept of ethnic diversity may not have been fully met because there was no inclusion of Latinos, Native Americans, or other groups. Similarly, differentiation between male and female respondents would be interesting given that studies have shown that there may be sex differences in the level of strabismus tolerability. Finally, the high false-positive response rate that they report (25.0%) brings into question whether the study methods are truly representative of the real world: when research participants are asked to look for strabismus, certainly they will respond differently than will random observers in a casual social setting. Previous studies using similar methods have reported similarly high false-positive response rates,⁷ demonstrating again that the power of suggestion is strong for participants who are asked to look specifically for strabismus.

Although the threshold at which strabismus becomes visible is likely to be important to our patients, this threshold does not necessarily correlate with the same threshold at which strabismus becomes socially significant. In addition, it certainly does not correlate with the angle of strabismus at which binocular function may be improved, and this aspect is of paramount importance to all patients except for those without vision in 1 or both eyes. The functional benefits of strabismus surgery must not be forgotten as we strive for postoperative measures of success. These functional outcomes are extensive and include the resolution of bothersome symptoms as well as the potential for improvement in binocular function. Most important, when patients experience diplopia or visual confusion, ocular realignment often proves to be an effective method by which to alleviate these symptoms. However, even with a lack of diplopia or visual confusion, strabismus can cause functional binocular deficits that are underappreciated. First, with abnormal ocular alignment, patients may experience a reduction in their visual field, which has been shown to contribute to motor vehicle crashes. Second, strabismus in elderly adults has recently been associated with an increased risk of fractures, falls, and musculoskeletal injuries, perhaps owing to altered depth perception.⁸ Finally, patients with strabismus may experience a lack of binocular summation, or even binocular inhibition, despite the lack of diplopia or visual confusion in many of them. For these reasons, we must not lose sight of the functional binocular issues and potential goals for strabismus surgery.

Furthermore, patients must be made aware of potential issues that they may encounter even if their strabismus falls within the acceptable range as determined by this study. For example, if a pediatric patient with a large intermittent exotropia undergoes strabismus surgery and is left after surgery with a small monofixational range esotropia, he or she may have a visibly acceptable result but is at risk for permanent loss of stereopsis. This type of scenario argues against using visually acceptable angles of strabismus as acceptable targets to define surgical success. Similarly, if an adult patient with a large hypertropia secondary to a congenital superior oblique palsy undergoes surgery and is left with a small overcorrection, such as hypotropia of 4 prism diopters, his or her eyes may appear straight to the casual observer, but the patient may still have intractable diplopia.

In summary, Chan et al⁶ should be congratulated for their work in defining thresholds for visually significant strabismus in an ethnically diverse population. This work will prove invaluable for our patients. However, we must continue to strive for functional measures of success in our patients with strabismus, using both sensory and motor criteria and considering all aspects of binocularity in assessing our work.

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