Pediatric Refractive Surgery

To the Editor:

I applaud Alió et al1 for providing a comprehensive and meticulous meta-analysis of peer-reviewed articles on pediatric laser refractive surgery, which appeared in the May 2011 issue of the Journal of Refractive Surgery. I appreciate this complex undertaking. The study adds knowledge to our understanding of laser refractive surgery on the treatment of high anisometropic ametropia and amblyopia in children.

I would like to add a few comments. The title of the article and the purpose state that the meta-analysis was undertaken “to provide an overview of the visual outcomes after pediatric refractive surgery in anisometropic amblyopia and to analyze the relationship of these outcomes with age and the type of refractive surgery.” Using data available in the peer-reviewed literature, the authors sought to offer a comprehensive perspective about the potential visual benefit of pediatric refractive surgery. However, to meet this goal, the authors should have included, rather than excluded, articles on phakic intraocular lenses (PIOLs) in children. Their aim cannot be fully realized without incorporating the PIOL data in children.2-5 Without including these data from various intraocular refractive surgery articles with/without the implantation of PIOLs, no true conclusion can effectively be reached in the meta-analysis of published articles on refractive surgery for treatment of amblyopia in children. The authors should have clearly stated in the title of their article, as well as in the purpose and introduction, that the intended aim of their study was only a meta-analysis of peer-reviewed articles on pediatric refractive laser surgery and its role in the treatment of amblyopia. The authors, by omitting this important and integral term from their report, thus have created their own bias as well as deviated from their own stated purpose of intended analysis of all published refractive surgery reports in children.

Moreover, the authors did not explain why “articles about IOLs in children were excluded” in their work. Phakic intraocular lens implantation as well as clear lens extraction for high myopic anisometropia and amblyopia comprises a critical subgroup of refractive amblyopia in children. By including this group of patients and publications, they could have made a stronger conclusion regarding refractive surgery (laser, PIOL, and clear lens extraction) and its positive predictive value on the treatment of amblyopia in children, thus strengthening their argument and article.2-5

Although Alió et al did not report any incidents of significant decentration in their study, a previous report has shown “slight decentration in axis of 5% can cause a 17% to 20% undercorrection.”6 Although they make an observation that children under general anesthesia are unable to fixate on the laser target beam for proper central fixation, they do not mention that the surgeon must rely on his/her best judgment to assume where the proper center of optical to visual axis lies under general anesthesia. Pupil centroid shift and cyclotorsional variations occur under general anesthesia as well as under supine positions, both of which may cause a significant induction in higher order aberrations, leading to a variable reduction in contrast sensitivity as a result.7-9 Haze, interface keratitis, and flap dislocation may all lead to a reduction in contrast sensitivity, which has never been calculated in the pediatric population due to difficulty in capturing the data in this particular age group.

Our goal in pediatric refractive surgery, laser or IOL implantation, beyond improving the visual acuity should be to strive to achieve the same standard we apply for our adult refractive population. At a minimum, we should improve visual acuity, but at best, we should aim to induce minimal higher order aberrations, so that we can improve both quality and quantity of vision for our pediatric patients.

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REFERENCES
Reply:

We thank Dr Pirouzian for his comments and suggestions concerning our recently published meta-analysis on pediatric laser refractive surgery.¹

Indeed, as he points out, we consider that the evidence supports the use of refractive surgery in children concerning amblyopia treatment. As mentioned in the article, this position should be interpreted with caution until long-term follow-up outcomes are reported concerning the evolution of such treated corneas.

We agree with the point Pirouzian makes about the inclusion of refractive phakic intraocular lenses (PIOL) in the article. However, as this was the subject of one of our most recent publications,² we excluded this subject from the analysis. Due to the limited number of published cases and the disparity of authors concerning implantation techniques, the sample was considered inhomogeneous for the purpose of a meta-analysis.

We agree that refractive surgery in children should be considered comprehensively. Both corneal and intraocular procedures target the same goal: correction of the refraction for the purpose of amblyopia treatment. We agree with this global concept and also commend Pirouzian for his work on this topic.³ Refractive amblyopia is difficult to treat, but modern refractive surgery provides hope.

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REFERENCES

Follow-up to “Central and Peripheral Corneal Iron Deposits After Implantation of a Small-aperture Corneal Inlay for Correction of Presbyopia”

To the Editor:

In our article, “Central and Peripheral Corneal Iron Deposits After Implantation of a Small-aperture Corneal Inlay for Correction of Presbyopia,” which appears in this issue of the Journal of Refractive Surgery,¹ we reported the appearance of central and paracentral corneal iron deposits following monocural implantation of the AcuFocus ACI 7000 corneal inlay (AcuFocus Inc, Irvine, California). This intracorneal inlay is designed to increase the depth of focus based on the principle of small aperture optics to restore near and intermediate visual acuity without a significant impact on distance vision.¹³ Recent publications support the efficacy and safety of this intracorneal inlay design for the treatment of presbyopia with published follow-up of up to 4 years.²³ These deposits seem to have no noticeable influence on visual acuity, either distance or near, corrected or uncorrected, and were observed in 56% of eyes (18/32 patients) after 36 months. Iron deposits occurred as a central dot (6%), a formation of paracentral deposits in the form of a half-moon in the inferior cornea parallel to the outer margin of the inlay, or a complete circular ring formation (55%). Seven additional eyes demonstrated deposits in both areas (39%). The median interval between ACI 7000 implantation and diagnosis of corneal iron deposition was 18±9 months. As reported for other corneal iron lines and dots,⁴,⁵ we suggested that alterations in tear film thickness, possibly its composition and corneal epithelial basal cell storage (as a result of minute changes of corneal topography) constitute the contributory factor for these specific iron depositions.

Within the past 3 years a new inlay design was developed, the ACI 7000PDT (KAMRA corneal inlay, AcuFocus Inc), with the acronym PDT listing its changed specifications: P = pattern (a variable-size hole pattern between 5 and 11 μm, with 8400 holes instead of 1600); D = darker (5% instead of 7.1% light transmission through the inlay); and T = thinner (5-μm instead of 10-μm thickness). The surgical technique was also modified, with the ACI 7000 cohort receiving a 170-μm superior-hinged flap and the ACI 7000PDT cohort receiving a 230-μm corneal pocket.

Recently, our study group completed the 18-month follow-up of 24 patients treated with the ACI 7000PDT inlay design. Corneal iron deposition was observed in 1 (4.17%) of 24 patients, whereas with the previous inlay design (ACI 7000) 10 (31.25%) of 32 patients showed corneal iron deposition after 18 months. Changes of corneal topography and consecutive corneal epithelial iron deposition occurred significantly less often with implantation of the ACI 7000PDT (Fig). The reduced inlay thickness and increase in the number of nutritional pores as well as the modified implantation technique seem to be the contributing factors for the decrease in the observed biomechanical changes.

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doi:10.3928/1081597X-20111109-01

AcuFocus Inc (Irvine, California) financially supports the “Research Foundation for Promoting Ophthalmology” (Salzburg, Austria) as the clinical research center of the University Eye Clinic (PMU) Salzburg. Dr Grabner received travel expenses from AcuFocus Inc. The remaining authors have no financial or proprietary interest in the materials presented herein.