

both medial and lateral rectus muscles. In otherwise normal infants and children, both are strong stimuli invoking CNS visual feedback driving towards normal alignment and permanent improvement in EOM length/tension parameters.

Conclusions: Simultaneous bilateral lateral rectus Botox injection is efficacious in selected cases of infant and childhood X(T). Permanent consecutive esotropia is rare. The majority of patients require one injection when administered between 2 and 4 years age. Botox provides "forced orthoptics" by inducing temporary, transient esotropia.

024 Functional burden of strabismus: Decreased binocular summation (bis) and binocular inhibition. Stacy L. Pineles, Federico G. Velez, Sherwin J. Isenberg, Eileen Birch, Steven Nusinowitz, Joseph L. Demer

Introduction: BiS is defined as the superiority of visual function for binocular over monocular viewing. BiS decreases with age and large interocular differences in visual acuity. BiS has not heretofore been well-studied as a functional measure of binocularity in strabismus.

Methods: Strabismus patients and normal controls underwent a battery of psychophysical and electrophysiological tests, including ETDRS VA, Sloan low contrast acuity (LCA, 2.5%, 1.25%), Pelli-Robson contrast test, and sweep visual evoked potential (sVEP) contrast sensitivity to determine BiS for each. BiS was calculated as the ratio between binocular and better eye scores.

Results: Sixty strabismic and 80 normal subjects were prospectively examined (age range, 8-60 years). Mean BiS was significantly lower in the strabismic patients than controls for the LCA charts (2.5% and 1.25%, $P < 0.0001$ for both). For 1.25% LCA, strabimics had a mean BiS score < 1 , indicating binocular inhibition. There was no significant BiS for contrast thresholds on the ETDRS, Pelli-Robson or sVEP. Regression analysis revealed a significant association between BiS and strabismus for 2.5% ($P < 0.0001$) and 1.25% ($P < 0.0001$) LCA accounting for age and interocular difference in visual acuity.

Discussion: BiS is significantly decreased in strabismus, and some measures of binocular function with two misaligned eyes viewing are worse than during monocular viewing. This may explain why strabismic patients who are not diplopic close one eye in visually-demanding situations. This finding represents an advancement in understanding of the visual deficits impacting quality of life in strabismic patients.

Conclusions: Strabismic patients demonstrate sub-normal BiS and even binocular inhibition for low contrast viewing, suggesting that strabismus impairs visual function more than previously appreciated. BiS may represent a novel measure by which to evaluate and monitor function in strabismus.

025 Abnormal rectus muscle length in horizontal strabismus. Ronen Rabinovich, Joseph L. Demer

Introduction: Sarcomere adaptation has been proposed to adjust rectus muscle lengths to regulate binocular alignment. We employed magnetic resonance imaging (MRI) to determine if the horizontal rectus muscles have abnormal lengths.

Methods: High-resolution, surface-coil MRI was obtained in 2 mm thick axial planes in strabismic patients who had not undergone prior surgery, and 15 controls verified to be normal by examination. Nine patients had esotropia (5 with divergence paralysis, 1 with partially accommodative, 2 with decompensated esotropia, and one with V pattern). Five patients had exotropia (3 intermittent, 2 with patterns). Lengths of horizontal rectus muscles were measured digitally

in central gaze. Because of multiple comparisons, the 0.01 level was considered significant.

Results: Mean (\pm SD) medial rectus (MR) length was 40.8 ± 4.6 mm in controls, not significantly different from 37.3 ± 4.2 mm in exotropia. In esotropia, the MR was significantly shorter at 35.7 ± 5.5 mm ($P = 0.0029$). Mean lateral rectus (LR) length in controls was 45.0 ± 4.2 mm, not significantly different from the values of 42.1 ± 4.4 mm in exotropia and 44.1 ± 8.0 mm in esotropia.

Discussion: Rectus muscle length depends not only upon eye position, which was central during all MRI imaging, but also upon muscle path length and curvature. These data suggest that esotropic patients have abnormally short MR paths that may contribute to the pathogenesis of strabismus. Medial rectus recession is therefore a particularly logical therapy for esotropia.

Conclusions: Medial rectus muscles are abnormally short in esotropia.

026 Outcome of surgery for nonparetic vertical strabismus. Sardar Mohammad, Ali A. Sadiq, David G. Hunter, Melanie Kazlas

Introduction: Vertical strabismus surgery is commonly performed using a 3/mm surgical dosage, with few reports of surgical outcomes, especially in patients with nonrestrictive strabismus. The purpose of this study was to analyze the outcomes of vertical strabismus surgery and evaluate the dose-response relationship of rectus and oblique muscle surgery.

Methods: Records of patients undergoing vertical strabismus surgery over a 1 year period were reviewed. Exclusion criteria included prior vertical surgery, restrictive strabismus, dissociated vertical deviation, and follow-up < 4 weeks. Main outcome measures were change in vertical deviation and collapse of A/V pattern.

Results: Of 85 patients identified, 49% were male (age, 0.9 - 81.2 years; follow-up, 4-31 weeks). Patterns collapsed to 0 in 6/8 with A pattern (75%) and 23/32 with V pattern (72%). Of 45 patients without A/V pattern, 32 (71%) attained orthotropia, with mean change in deviation of 11 (91%). In the 18 patients without oblique surgery, surgical response was 2.7/mm. For preoperative deviations of < 5 , the change was 1.4/mm; for 5-9, 2.7/mm, and for 10-14, 3.4/mm. In the 20 patients who underwent unilateral inferior oblique (IO) weakening procedures without rectus muscle surgery, 11 (55%) attained orthotropia, with an average change in deviation of 10.4.

Discussion: Vertical rectus muscle surgery changed ocular alignment by 2.7/mm, while IO surgery had an average effect of 10.4. The dose-response was larger for larger preoperative deviations.

Conclusions: The dose-response curve for vertical rectus muscle surgery, often cited as 3/mm, may be more dependent on the preoperative deviation than previously believed.

027 Clinical spectrum and uveal melanoma based on age at presentation in 8,033 cases. Carol L. Shields, Swathi Kaliki, Minoru Furuta, Arman Mashayekhi, Jerry A. Shields

Introduction: To evaluate prognosis of uveal melanoma based on age.

Methods: Chart Review.

Results: Of 8033 patients with uveal melanoma, 106 were young (< 20 years), 4287 in mid-adults (21-60 years), and 3640 in older adults (> 60 years). Based on age (young, mid-adults, older adults) tumor locations was iris (21%, 4%, 2%), tumor diameter (10.2, 10.8, 11.5 mm) and thickness (5.0, 5.3, 5.7 mm) increased ($P < 0.0001$). Kaplan-Meier metastasis at 10 and 20 years were 9% and 20% in young ($P < 0.011$);

23% and 34% in mid-adults ($P < 0.0001$); and 28% and 39% in older adults.

Discussion: Uveal melanoma in children represents only 1% of all uveal melanoma. More often, it affects the iris and has related ocular melanocytosis. Similar to cutaneous melanoma, prognosis in children tends to be more favorable than adults. Several reports have shown younger age as an independent factor influencing reduced risk for metastasis. This, along with smaller tumor size, could be responsible for the more favorable prognosis for younger patients.

Conclusions: Young patients showed lower melanoma metastasis.

028 Guidelines for prescribing initial contact lens power if refraction is not possible: Analysis of subjects enrolled in the Infant Aphakia Treatment Study. Rupal H. Trivedi, Scott Lambert, Michael J. Lynn, M. Edward Wilson Infant Aphakia Treatment Study Group

Introduction: When fitting infant aphakic eyes with a contact lens (CL) immediately after cataract surgery, it may not always be possible to obtain an accurate refraction. For such cases there is a tendency to insert a +32 D CL. We sought to provide guidelines for the selection of an initial CL power if retinoscopy over a diagnostic lens is not possible.

Methods: Patients with a unilateral cataract and randomized to CL treatment in the Infant Aphakia Treatment Study (IATS) were analyzed. An eye was included if there was a valid preoperative axial length (AL) measurement using immersion and a one-month postoperative refraction. Target CL power was determined using refraction (adjusting for vertex distance of 12 mm) over known CL power one-month postoperatively. We compared it with four techniques: (1) physicians estimated CL power (defined as the prescribed CL power minus 2D overcorrection based on IATS protocol); (2) regression1, CL power = $84.4 - 3.2 \times \text{AL}$; (3) SRK/T IOL power1 calculated using a modified A-constant (112.176); (4) 32 D CL.

Results: There were 36 of 57 eyes that met the inclusion criteria. Age at cataract surgery was 2.3 ± 1.7 months. Preoperative AL was 17.9 ± 1.6 mm. Follow-up refraction was performed at 31 ± 3 days. Target CL power based on the one-month refraction was 26.0 ± 4.4 D. Mean prediction error was 0.4, -1.0, -2.0, and 6.2 D and mean absolute prediction error was 1.2, 2.2, 2.8 and 6.2 D respectively for physicians estimated CL power, regression, SRK/T and 32 D CL.

Discussion: The IATS study protocol reads that if an accurate refraction could not be obtained initially, a +32 D CL should be dispensed, and the lens power should subsequently refined at the earliest opportunity. If refraction is not possible, instead of using +32 D CL, we recommend using preoperative biometry to estimate CL power.

Conclusions: If accurate refraction could not be obtained initially, preoperative biometry may help to estimate CL power.

029 Outcomes of iris-enclaved Artisan-Optec intraocular lens implantation in aphakic children. Lawrence Tychsen, Nicholas Faron

Introduction: Children treated by lensectomy for ectopia lentis, traumatic cataract with lens subluxation or severe persistent fetal vasculature-related cataracts lack capsular support for implantation of standard, posterior-chamber intraocular lenses (IOL). We reported previously use of trans-scleral sutured IOLs in this population. Here we describe outcomes of Artisan iris-enclaved IOL implantation.

Methods: Clinical outcome data were collated prospectively in 28 aphakic eyes of 17 implanted children (7 Marfan syndrome; 5 familial

ectopia lentis; 5 persistent fetal vasculature). All children had difficulties with contact lens or spectacle wear. Peripheral iridectomy was performed at IOL implantation. Mean age at surgery was 8.1 yrs (range, 1-17 years); mean follow-up was 3.1 yrs.

Results: Aphakic spherical correction averaged 14.06 D (range, +7.75 to +19.75). 26/28 eyes (93%) were corrected to within ± 1.0 D of emmetropia and all to within 1.5 D. Uncorrected visual acuity improved from an average logMAR 1.50 (20/640) to 0.17 (20/30); best-corrected acuity improved an average 2 Snellen lines (0.18 logMAR). Four eyes (20%) required an additional vitrectomy or laser-iridotomy for pupillary block 1 day to 9 mos after IOL implantation. Two IOLs (7%) were explanted; one for repeated de-enclavation and one for microcornea-related glaucoma and corneal decompensation.

Discussion: Implantation of the Artisan aphakic IOL improved visual acuity substantially and was well-tolerated in the majority of children. Repeat vitrectomy at IOL implantation is recommended to reduce the risk of pupillary block caused by vitreous plugging of the iridectomy.

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030 Visual acuity and macular optical coherence tomography abnormalities in children with history of retinopathy of prematurity. Victor M. Villegas, Hilda Capo, Kara Cavouto, Audina M. Berrocal

Introduction: To correlate visual acuity (VA) and macular optical coherence tomography (OCT) findings in patients with history of retinopathy of prematurity (ROP) and normal macular funduscopy.

Methods: This retrospective cohort study reviewed the charts of all ROP patients evaluated during the last 2 years. Children with prior OCT were included. Patients with abnormal macular funduscopy or prior vitrectomy were excluded. Subjects were divided by VA into group 1 if $>20/40$, and group 2 if $<20/40$.

Results: Sixteen patients were identified: 14 eyes in group 1 and 13 in group 2. All patients except one had abnormal foveal contours. Mean values in groups 1 and 2 included: VA, 20/25 vs. 20/62, age in years, 8.8 vs 12.4, spherical equivalent, -3.42 D vs -5.00 D, and gestational age in weeks, 27.1 vs. 26.2. Eight eyes in each group had laser therapy. Mean central foveal thickness in micrometers was 276 and 296 in groups 1 and 2 respectively. Retention of inner retinal layers was found in 63% in group 1 and 66% in group 2.

Discussion: Patients with history of ROP frequently have abnormal foveal morphology by OCT, including retention of inner retinal layers. Abnormal foveal contour associated with ROP does not necessarily imply poor visual acuity.

Conclusions: Macular structural abnormalities detected by OCT do not always correlate with visual acuity. Other factors may play a role in the visual development of children with history of ROP.

031 The effects of surgical factors on postoperative astigmatism in patients enrolled in the Infant Aphakia Treatment Study. Palak B. Wall, Jason A. Lee, Michael Lynn, Scott R. Lambert, Elias I. Traboulsi

Introduction: The purpose of this study is to compare postoperative astigmatism between patients treated with intraocular lens (IOL) or