

HIGHER THE BETTER: A STUDY OF CHANGE IN POSITIVE FUSIONAL VERGENCE WITH ILLUMINATION LEVELS

Raisul Azam*, Sourav Karmakar, Animesh Mondal, Gaurav Kumar Bhardwaj

*Department of Optometry and Vision Science, Amity Medical School, Amity University
Haryana, India*

Introduction: Positive Fusional Vergence (PFV) is vital in maintaining fusion in critical and continuous near tasks such as reading or digital screen tasks affecting productivity at work and study in today's knowledge era. The aim of this study was to compare the change in positive fusional vergence in different illumination levels required for near-vision performance. **Methods:** This cross-sectional study consists of 34 participants aged between 21 and 25 years, with a BCVA (Log MAR) of 0.0 and insignificant refractive error. Ocular parameters, namely PFV (blur, break, recovery), contrast sensitivity, and pupil diameter, were tested in three different illuminations, namely Low Illumination- 50 Lux, Medium Illumination -100 lux, and High Illumination-150 lux. **Results:** There was a significant change in pupil diameter with different room illuminations ($p < 0.00$). But there was no significant change in contrast sensitivity under three room illumination levels ($p = 0.368$). The mean PFV (in D) (blur) was 14.5(SD 2.5) 50Lux; 10.2(SD 2.2) at 110Lux was and 8.2(SD 2.1) at 150Lux. Similarly, PFV (break) values were 16.7(SD 2.4), 13.4(SD 1.8), and 10.8(SD 2.2) and PFV (recovery) values were 13.3(SD 2.1), 10.7(SD 2.1), 7.5(SD 2.7) under 50, 100, and 150Lux respectively. PFV blur, break, and recovery values significantly decreased ($p < 0.001$) with increased illumination levels. **Conclusions:** PFV in low illumination is significantly affected as compared to that in high illumination. The study provided an explanation for the trigger of asthenopia, especially in low-light conditions. The results of this study can be used in guiding patients for appropriate levels of illumination, which can help them maximise their visual performance and productivity at wo

EFFECT OF ANEMIA ON BINOCULAR VISION

Shraddha Naik^{1*}, Suhas Kalashetti², Vidyut Rajhans³, Mahima Chandra⁴

¹*School of Optometry, Bharati Vidyapeeth Deemed University, India*

²*General Medicine, Shree Samarth Hospital, India*

³*Laxmi College Of Optometry, Laxmi Eye Institute, India*

⁴*School of Optometry, Bharati Vidyapeeth Deemed University, India*

Introduction: Active binocular functions such as accommodation and convergence consume significant oxygen and glucose from the blood. This affects ocular smooth muscles, causing fatigue and irritability, which leads to asthenopic symptoms. The aim of this study was to assess the effect of anaemia on binocular vision functions. **Methods:** In a cross-sectional study, ocular parameters considered were visual acuity (distance and near), objective refraction, PBCT, NPA and NPC, accommodative and vergence facility, NFV, PFV, and stereoacuity. These parameters were compared between anaemic and non-anaemic groups. Statistical analysis was done using the Chi-square test and Pearson's correlation in SPSS (V22.0). **Results:** A total of 208 participants with a mean age of 28.44 ± 3.763 years and a mean Haemoglobin level of 11.17 ± 2.935 were included in the study. Asthenopic and ocular symptoms were reported by 146 (70.19%) participants, with 63 (43.15%) of them being anaemic. This association was found to be significant. The results of the study showed significant differences between NPC (break and recovery) and accommodative facility ($p < 0.05$). Additionally, a weak but significant correlation was observed between NPC break ($r = 0.261$) and recovery ($r = 0.209$), accommodative facility ($r = 0.281$), and Hb levels. **Conclusions:** Low Hb levels affect binocular functions, mainly NPC and accommodative facilities. This may result in disturbed visual performance in everyday activities such as reading. Therefore, a detailed optometric workup is necessary for anaemic patients. Prophylactic management of binocular visual function in anaemic patients is also suggested.

IMPACT OF VISION THERAPY COMPARED TO PATCHING THERAPY ON VISUAL ACUITY AND STEREOACUITY IN AMBLYOPIA

Rinkal Suwal ^{1*}, Mahesh Kumar Dev ²

¹*Department of Optometry, BP Eye Foundation, Hospital for Children, Eye, ENT, and Rehabilitation Services (CHEERS), Nepal*

²*School of Optometry & Vision Science, Queensland University of Technology, Australia*

Introduction: Sequential monocular, binocular and binocular phases of active vision therapy (AVT) result in higher improvements in visual acuity (VA) and stereoacuity than patching therapy in children with amblyopia. The aim of this study is to compare improvements in VA and stereoacuity between AVT and conventional patching therapy in children with amblyopia. **Methods:** This longitudinal study included 65 children aged 5 to 16 years who underwent unilateral amblyopia treatment. Among them, 31 children (mean age \pm SD, 11.13 \pm 3.64 years) underwent active vision therapy (AVT group), and 34 children (mean age \pm SD, 10.88 \pm 2.99 years) underwent conventional patching therapy (patching group). Children in the AVT group underwent three sequential phases of AVT (1 month for each phase): Monocular phase (pursuit, saccades, fixation, visuomotor, eye-hand coordination, and central peripheral activities), binocular phase (diplopia awareness, anti-suppression, monocular fixation in a binocular field, accommodative activities, bilateral integration, and fine motor activities) and binocular phase (fusion and stereopsis). Children in the patching group patched their fellow eyes per guidelines established by the Paediatric Eye Disease Investigator Group. Monocular distance VA and stereoacuity were measured at baseline and after three months of therapy in both groups. The improvements in these vision measures were compared within and between the two groups. **Results:** There were significant improvements in the mean acuities in amblyopic eye (AE) in both AVT (0.32 \pm 0.11 logMAR, $p < 0.001$) and patching groups (0.27 \pm 0.19 logMAR, $p < 0.001$). However, there was no significant difference in mean acuity gains in AE between AVT and patching groups ($p = 0.059$). The mean gains in stereoacuties (log seconds of arc) were also significantly better in both the AVT group (0.81 \pm 0.34, $p < 0.001$) and patching group (0.32 \pm 0.34, $p < 0.001$). Importantly, the mean stereoacuity gain in the AVT group was significantly higher compared to the patching group ($p < 0.001$). **Conclusions:** Active vision therapy had a better impact than conventional patching therapy in terms of improvement of stereoacuity but not VA in treating children with amblyopia.

SUB-FOVEAL CHOROIDAL THICKNESS IN UNILATERAL AMBLYOPIC NEPALESE CHILDREN

Manisha Paudel^{*}, Parash Gyawali, Ashutosh Jnawali, Jyoti Baba Shrestha, Sanjeeb Kumar Mishra, Sanjeev Bhattarai, Anish Kharal, Neha Karna

*Department of Ophthalmology, B. P. Koirala Lions Center for Ophthalmic Studies,
Institute of Medicine, Nepal*

Introduction: Choroid is a vascular outer coat of the eyeball that is speculated to have a close relationship with emmetropisation. However, the association of choroid with amblyopia is not clearly known. The purpose of this study was to evaluate subfoveal choroidal thickness (SFCT) in Nepalese children with unilateral amblyopia. Also, the subfoveal choroidal thickness of amblyopic eyes was compared with those of fellow eyes and eyes of the control group. **Methods:** Forty unilateral amblyopic children (20 anisometropic amblyopia and 20 strabismic amblyopia) 5 to 16 years of age were included in this cross-sectional study. Forty age-matched emmetropic children were taken as controls. Axial length was measured using Partial Coherence Interferometry. Subfoveal choroidal thickness was measured using enhanced depth imaging spectral domain optical coherence tomography in all subjects and controls using an inbuilt calliper. **Results:** Mean subfoveal choroidal thickness in amblyopic and fellow eyes were $350.70 \pm 67.85 \mu\text{m}$ and $299.02 \pm 48.85 \mu\text{m}$, respectively, and $288.65 \pm 40.96 \mu\text{m}$ in the control group. Subfoveal choroidal thickness in amblyopic eyes was significantly thicker compared to fellow eyes ($P < 0.01$) and eyes of the control group ($P < 0.01$). The mean subfoveal choroidal thickness between anisometropic amblyopic and strabismic amblyopic eyes did not differ significantly ($P = 0.512$, mean difference \pm SD: $14.30 \pm 136.67 \mu\text{m}$, 95% CI: $29.45 \mu\text{m}$ to $58.05 \mu\text{m}$). Subfoveal choroidal thickness in mild, moderate, and severe amblyopia did not differ significantly by group ($P = 0.191$). There was no significant correlation of mean subfoveal choroidal thickness in amblyopic eyes with age, best corrected visual acuity, axial length, and spherical equivalent refraction (SER) ($P > 0.05$ in all cases). **Conclusions:** Mean SFCT in unilateral amblyopic eyes was significantly thicker compared to that of fellow eyes and eyes of the control group. The type and severity of amblyopia did not affect SFCT measurements. Our finding suggests that an amblyopic eye may have a different ocular growth mechanism and is likely independent of the fellow eye, as indicated by subfoveal choroidal thickness differences. These primary findings could provide support for further studies in understanding the pathophysiology of amblyopia.

ACCOMMODATIVE SPASM WITH BILATERAL VISION LOSS DUE TO INTERMITTENT EXOTROPIA IN AN ADOLESCENT

Sonia Sharma

Optometry Vision Science, DRISHTI The Vision Care, India

A 15-year-old female complained of blurred vision increased at near and distance for 2-3 months during her exams and intermittent outward deviation of both eyes noticed in the past 4-5 years. She was also not doing well in her studies, and her father scolded her as he assumed the child didn't want to study. Her family is also struggling with financial problems. There was no family history of squint or glasses. The patient was found to have 20/400 vision in both eyes at distance (D) and N36 vision at near (N). Dynamic retinoscopy revealed a 3D lead of accommodation. On motor examination, the angle of deviation at D was 30 XT and 25 XT at N with no pattern. On sensory evaluation, there was crossed diplopia at D and N, and 400 sec of arc stereopsis was present at N on performing the Titmus Fly Test. There was no history of systemic illness or ocular or head trauma. The patient had bilateral accommodative spasm with high pseudo myopia and bilateral severe vision loss at near and distance. Her condition became worse after discontinuation of the vision therapy. In the first phase, she was advised to do Vision and Prism Therapy to stabilise her eye condition. The maximum prism was prescribed in the second phase using Prism Adaptation Test (PAT). In the third stage, squint surgery was advised for a permanent solution. Eye condition should become stable and relieve symptoms after combining Vision and Prism Therapy. The eye condition became stable after following the treatment plan as suggested. There was no lead of accommodation, and restored 20/20 vision at D and N6 vision at N. There was no change in the angle of deviation. Currently, the patient is wearing prism glasses in both eyes and doing fusional vergence exercises to maintain the condition till the surgery plan.

FUJI OPTICAL' S VISION AID MISSION SERVICED TO THE OVERSEAS REFUGEES WORKING WITH UNHCR

Akio Kanai

Fuji Optical, Japan

A team of Optometrists consisting of volunteers from Fuji Optical Co. in Japan conducted a series of vision aid missions for overseas refugees since 1983. The team visited refugee camps offering eye examinations and dispensing free ready-made glasses on site.

The first mission was instituted for the Indo-Chinese refugees in Thailand, responding to the request made by the camp educators. Refugees were suffering without proper glasses while receiving a series of education and vocational trainings in the camp preparing for the third country resettlement. They left their own countries without glasses, lost or broken.

After the first mission, the UNHCR Office in Bangkok conducted a survey in the camp to find out how the vision aid mission was received by the refugees. They were quite impressed by the positive result beyond their expectation and they requested us to continue the mission with the offer of providing all the official assistance needed as a counterpart, such as the duty-free customs clearance of the ready-made glasses shipped from Japan. This was the moment when the UNHCR officially recognized the optometric service to the refugees in their history, which was further developed into the Private Sector Partnership Relationship.

We are proud that Fuji Optical continues to be the longest partner of the UNHCR among all the corporate sectors globally. The mission has covered Nepal, Armenia and Azerbaijan besides Thailand.

The total number of the pre-made glasses donated to the UNHCR is over 177,000 pairs and the total number of the volunteers who joined the mission is 195 persons. Other statistical data and various outcomes related to the decades of work will be highlighted.

UPDATE ON DIABETIC RETINOPATHY - OPTOMETRIC MANAGEMENT IN ANTI-VEGF ERA

Kuniyoshi Kanai

*Herbert Wertheim School of Optometry & Vision Science, University of California, Berkeley,
United States*

Diabetic retinopathy continues to be the leading cause of blindness for working-age adults in many countries. Early Treatment Diabetic Retinopathy Study (ETDRS) set the gold standard of diabetic retinopathy and macula edema management in the 1970s. After 40+ years, two key evolutions changed how patients are managed in the modern era.

Optical coherence tomography allows accurate diagnosis of diabetic macular edema and even enables the detection of neovascularization without traditional fluorescein angiography. The introduction of anti-vascular endothelial growth factor (anti-VEGF) treatment for macular edema has shown superior treatment effects to laser therapy. As the medical field recognized the effectiveness of new diagnostic and therapeutic tools, the approach to patient care gradually shifted. Historical focal and grid laser treatment for macular edema is seldom performed in tertiary referral clinics in favour of anti-VEGF therapies. The treatment judgment of macular edema has shifted from the presence of ETDRS Clinically Significant Macular Edema to Center-Involved diabetic macular edema (CI-DME). Some clinicians advocate the use of anti-VEGF for the management of diabetic retinopathy itself.

The present lecture extrapolates findings from National Eye Institute-funded studies, such as various DRCR.net study protocols. It clarifies the strengths and pitfalls of the current OCT-based diagnosis and real-world use of anti-VEGF. In particular, the lecture focuses on what defines CI-DME and how to coordinate patient care.

THE ROLE OF OPTOMETRISTS IN PRIMARY EYE CARE

George Woo

School of Optometry, The Hong Kong Polytechnic University, Hong Kong

Primary eye care is an integral part of primary health care. It entails the provision of first contact care that is comprehensive, continuing, co-ordinated and person-centered in the context of family and community.

Optometrists are the primary eye care professionals that the public automatically go for having their eye and vision care. In this presentation, the role of optometrist is described in terms of the World Council of Optometry's Global Competency-Based Model of Scope of Practice. The competency model is designed to be applicable globally with different levels of primary eye and vision care.

The integrated approach towards a comprehensive eye examination is elaborated. Full scope optometric practice contains six essential elements. They include screening for ocular disease, objective and subjective refraction, binocular vision testing, ophthalmic dispensing, co-management of ocular disease and refractive surgery and vision rehabilitation assessment. Each of these elements is illustrated with examples.

As primary eye care providers, optometrists serve as gatekeepers and are prepared to refer patients to other practitioners for secondary and tertiary care where appropriate, whether for diagnosis, treatment or support.

RETINAL VASCULAR OCCLUSIONS – TREATING THE WHOLE PATIENT

Jessica Neuville

School of Optometry, The Hong Kong Polytechnic University, Hong Kong

Retinal vascular occlusions are an ocular manifestation of underlying systemic disease that require a multidisciplinary management approach. This lecture will increase awareness of the risk factors for vascular occlusions and present updated treatment and management guidelines to reduce the risk of severe ocular consequences (e.g. macular edema, neovascularization) and life-threatening systemic conditions (e.g. stroke and myocardial infarction).

The potential use of telemedicine and artificial intelligence for prompt diagnosis will also be discussed.

REGIONAL VARIATIONS IN THE PREVALENCE OF MYOPIA – FINDINGS FROM TRUMP STUDY

Rakesh Maldoddi^{*}, Satish Gupta, Swapnil Thakur, Rohit Dhakal, Pavan Verkicharla

Myopia Research Lab, Brien Holden Eye Research Centre, L V Prasad Eye Institute, India

Introduction: Myopia - A public health issue of the twenty-first century, is estimated to affect five billion world's population (50%) by the year 2050. Although myopia is considered an epidemic, regional and socio-economic variations exist in myopia prevalence. Thus, we aimed to estimate the prevalence of myopia in urban and rural school-going children. **Methods:** A cross-sectional, prospective Telangana Rural Urban Myopia Prevalence (TRUMP) study was conducted in Indian children aged 8-17 years. The study was carried out in 18 schools (urban-10 and rural-8 schools) from July 2022 to January 2023. Bailey-Lovie LogMAR visual acuity charts and open-field autorefractor were used to assess visual acuity and non-cycloplegic objective refraction, respectively. Myopia was defined as non-cycloplegic spherical equivalent refraction (SER) of ≤ -0.50 dioptres (D) with a visual acuity cut-off of 0.2 logMAR or worse. Based on IMI classification, participants with myopia were further categorised into two subgroups: low myopia: SER ≤ -0.50 D and > -6.00 D and high myopia: SER ≤ -6.00 D. Only data from the right eye was considered for analysis. **Results:** A total of 4261 children (urban; n=2675, mean age=13.88 \pm 1.91 years and rural; n=1586, 13.11 \pm 1.69 years) were included in the final analysis after excluding the participants with conditions that may potentially alter the refractive error. The overall prevalence of myopia (urban and rural regions) was found to be 18.54%, with being higher in males (20.87%) than in females (16.55%). Further analysis reported that the prevalence of myopia was significantly higher in urban school children (24.82%) when compared to the rural region (7.94%, $p < 0.01$). This trend was similar for high myopia, with more prevalence in urban (1.27%) than rural school children (0.19%). **Conclusions:** The prevalence of myopia was found to be higher in urban than in rural regions of Telangana State. Time trend comparisons of the prevalence of myopia between the previous and current study reveal that myopia prevalence has been on a rapid rise in recent years. Eye care professionals need to be vigilant about the rising prevalence of myopia to deliver eye care services and recommendations to avoid or delay the onset of myopia.

MYOPIA PROGRESSION RISK ASSESSMENT SCORE (MPRAS) – A PROMISING NEW TOOL FOR RISK STRATIFICATION

Manoj Manoharan *, Swapnil Thakur, Rohit Dhakal, Satish Gupta, Jacinth Priscilla, Shashank Bhandary

Myopia Research Lab and Infor Myopia Centre, L V Prasad Eye Institute, India;

Introduction: Timely identification of individuals “at-risk” for myopia progression is the leading requisite for myopia practice as it aids in the decision of appropriate management. This study aimed to develop a ‘Myopia Progression Risk Assessment Score’ (MPRAS) based on multiple risk factors (10) to determine whether a myope is “at-risk” or “low-risk” for myopia progression. **Methods:** Two risk-score models (model-1: non-weightage, model-2: weightage) were developed. The ability of MPRAS to diagnose individuals "at-risk" for myopia progression was compared against the decisions of five clinicians in 149 myopes aged 6-29 years. Using model-1 (no-weightage), a further seven sub-models were created with varying numbers of risk factors in decreasing step-wise manner (1a: 10 factors to 1g: 4 factors). Receiver Operating Characteristics were used to determine a cut-off value (based on Youden's J-index), sensitivity, specificity, and area under the curve (AUC). **Results:** In random eye analysis for model-1, the highest Youden's index (0.63-0.65) led to the MPRAS cut-off score of 41.50 to 43.50 for five clinicians with a sensitivity ranging from 78-85% and specificity ranging from 79-87%. For this cut-off score, the mean area under the curve (AUC) between clinicians and the MPRAS model ranged from 0.89-0.90. Model-2 (weighted for a few risk-factors) provided similar sensitivity, specificity, and AUC. Sub-model analysis revealed greater AUC with high sensitivity (89%) and specificity (94%) in model-1g, which has four risk factors compared to other sub-models (1a to 1f). **Conclusions:** All the MPRAS models showed good agreement with the clinician's decision to identify individuals "at-risk" for myopia progression.

NOVEL BIOMETER-BASED TECHNIQUE FOR ANTERIOR SCLERAL THICKNESS: POTENTIAL FOR APPLICATION IN MYOPIA

Satish Kumar Gupta^{*}, Rohit Dhakal, Pavan Kumar Verkicharla

Myopia Research Lab, Brien Holden Eye Research Centre, L V Prasad Eye Institute, India

Introduction: The ocular expansion in myopic eyes is associated with thinning of various coats of the eyeball, primarily at the level of the retina, choroid, and sclera at the posterior pole. However, recent evidence reports significantly thinner anterior sclera along the inferior meridian in high myopes than emmetropes and mild to moderate myopes indicating a potential role of the anterior sclera in myopiogenesis and myopia progression. On the other side, optical biometers are gaining popularity in myopia research and practice to accurately determine the various biometric details of the eye. Therefore, we applied and validated a biometry-based technique for estimating the anterior scleral thickness (AST) using optical coherence tomography (OCT) landmarks. **Methods:** The AST was determined across four meridians in 62 participants (20-37 years) with a swept-source OCT and a non-contact optical biometer at a mean distance \pm SD of 3.13 ± 0.88 mm from the limbus. The biometer's graticule was focused and aligned with the anterior scleral reflex that led to the generation of four prominent A-scan peaks: P1-anterior bulbar conjunctiva, P2-anterior episclera, P3-anterior margin of the anterior sclera, and P4-posterior margin of the anterior sclera, which were manually analysed based on OCT landmarks to determine the thickness of various structures. **Results:** The AST measurements between the biometer and OCT correlated for all meridians ($r=0.82$, CoV: 9-12%; $p<0.01$). The mean difference between the two instruments for overall AST measures was $-3\mu\text{m}$ (range: -18 to $+16\mu\text{m}$, LOA: -89 to $+83\mu\text{m}$; $p=0.23$) across all meridians. The mean $AST\pm SE$ with both instruments was found to be the thickest at the inferior ($562\pm 7\mu\text{m}$ and $578\pm 7\mu\text{m}$) and the thinnest at the superior ($451\pm 7\mu\text{m}$ and $433\pm 6\mu\text{m}$) meridian. The biometer demonstrated good intra- (CoV: 8.4-9.6%) and inter-session (CoV: 7.9-13.3%) repeatability for AST measurements across all meridians. **Conclusions:** The non-contact optical biometer, which is typically used to determine axial length, is capable of accurately estimating the AST based on OCT landmarks. The biometry-derived AST measurements strongly correlate and agree with a high-resolution SS-OCT. Therefore, the optical biometer demonstrates extended useability for determining the changes in AST, which has a high potential for its application in myopia research and practice.

