Sensory Fusion, Motor Fusion, Life... A Top Down Approach For Better Outcomes in Strabismus

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Overview
- Prevalence of strabismus is 1-4% of the population
- Types: Esotropia, Exotropia, Hypertropia
- Definition: A dysfunction in the visual system affecting proper coordination of the two eyes, leading to defective depth perception, defective eye movement control and defective eye-hand coordination.

Assessment of Strabismic Patients
- Visual Acuity: Determine if amblyopia is present
- Cover Test in all gazes: Determine if angle is constant or non constant
- Worth 4 Dot: Determine zone of suppression
- Maddox Rod: Assess if anomalous correspondence is present
- Visuocoopy: Assess if eccentric fixation present
- Refraction
- Verge Testing if Able
- Accommodation Assessment
- Oculomotor: Pursuits and Saccades
- Comprehensive Eye Health Evaluation
- Visual Processing Testing When Applicable

Treatment Options
- Surgery
- Prism: Fresnel or ground in
- Vision Therapy

Treatment Tools
- Lenses
- Prism: Compensatory, Therapeutic, Yoked
- Binocular Vision
- Vision Therapy:
  - Office Based Vision Therapy with Home Support Activities

Phases of Vision Therapy Treatment

1. Orientation
2. Conscious
3. Leading
Vision Therapy for Strabismic Patients

- Have patients set their goals that they hope to achieve in vision therapy.
- Recommend strabismic patients keep a journal during their VT journey.
- Antisuppression
- 5th Degree Fusion = Simultaneous Perception
- 5th Degree Fusion = Heterophoria
- Expand Range of Fusion
- KEY: Ensure transfer of visual skills learned in the therapy room to patient's everyday life.

Esotropia Treatment Protocol

PHASE 1:
- Application of bilateral and binocular occlusion on ALL eyes
- Antisuppression Therapy: Send home MFBI activities to be completed for 4 hours daily
- Home Vivid Vision sent home with angle of deviation set on the unit
- Focus on peripheral awareness activities and peripheral fusion
- Build sensory and motor fusion ranges
- Begin base in tracking using VTS4 doggling target
- **Apply Fresnel Prism if needed/appropriate**

VTS4 Base In Tracking Sheet

Esotropia Treatment Phase 2

- Build flexibility in vergence and accommodative system: BIM/BOP
- Add loading to vision therapy activities:
  - Cognitivo
  - Vestibular
  - Auditory

Exotropia Treatment Protocol

- Antisuppression Therapy: Send home MFBI activities to be completed 1 hour per day
- Home Vivid Vision sent home set at patient's angle of deviation
- Focus on detailed activities
- Strengthen accommodation
- Build peripheral fusion
- Build sensory and motor fusion ranges
- Begin base out tracking on VTS4 doggling target
- **Apply Fresnel prism if needed/appropriate**

VTS4 Base Out Tracking Sheet
Exotropia Treatment Phase 2
- Build flexibility in vergence and accommodative system: BIM/BOP
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  - Cognitive
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Phase 3 for All Strabismic Patients: Application of Skills in LIFE!
- Modify traditional vision therapy techniques to target patients’ goals
- Discuss/encourage the patient to try new things that they typically avoided in the past
- Example: Play catch, go to a batting cage etc.

Pearls for Working with Strabismic Patients in Therapy
- Be creative in therapy to help each patient achieve their individual goal
  - The low GI team will present 3 cases and show how we modified traditional techniques to specifically help the patient achieve THEIR goals!
  - Remember that there is a significant emotional component for these patients, especially in adults that have had this their entire life.
  - Have empathy and understand that these patients will have good days and bad days in therapy and be supportive on their journey.

Strabismus impact on mental health

**Objective:** Study investigated the prevalence and types of psychiatric disorders diagnosed by early adulthood who had forms of strabismus as children
- Strabismus affects 3-5% of children
- Exotropia > Exotropia in Western populations
- Exotropia > Exotropia predominates the Asian population
Methods: Medical records of children (0-9 years) who were diagnosed as having strabismus were reviewed retrospectively for psychiatric disease diagnoses.
- Each case subject was compared to a randomly selected, individual birth- and gender-matched (control subject)

Results: Mental health disorder was diagnosed for 469 of the 4,970 patients with a history of childhood strabismus (94.3%) compared to the control subjects (30.7%).

Results: Children with exotropia were 3x more likely to develop a psychiatric disorder than were control subjects.
- Intermittent exotropia was significantly more likely to have more:
  - mental health disorders
  - mental health emergency visits
  - mental health hospitalization
  - suicide or hospitalization

Patients with strabismus in this study displayed:
- greater number and severity of mental illness compared to the control group.

American Journal of Ophthalmology

The effects of strabismus on quality of life in adults
Sarah R. Hall, David A. Leske, [ ] and Jonathan M. Holmes

Additional information

Strabismus and Quality of Life

Objectives: In-depth interviews to identify the specific concerns of adults with strabismus.
- 30 adults with strabismus
- 15 without diplopia
- phrases regarding how strabismus affected everyday life were grouped into topic areas

Results:
- Patients experiencing diplopia:
  - MOST frequent occurring topic: negative/feeling weak, hard, emotionally draining, miserable
  - general disability affects everything, feel handicapped, problems getting through the day
  - driving (poor vision when driving, driving tense)
  - self-esteem/self-esteem

Patients not experiencing diplopia:
- MOST frequent occurring topic: Appearance to others "people notice my eyes, look at me funny"
- "Eye contact"
- "Interruption of relationships (hard to talk to people, make people uncomfortable)"

Results:
- Similarities between the patients with and without diplopia:
  - Self appearance
  - Communication with others
  - Financial (lost jobs because bull of eye contact)
  - Self-confidence
  - Work took longer

Differences between patients with and without diplopia:
- "Bumping into things and walking - diplopia worse"
Conclusion:

- Quality of life concerns varied between the patients with diplopia and without diplopia.
- Non-diplopia patients expressed problems with interpersonal relationships and non-verbal communication.
- Patients with diplopia reported problems with everyday physical functioning.

Strabismus & Life

- Purpose: To see the effect of strabismus on mental health and quality of life aspects in children and adolescents.
- Method: Baseline Survey was given to 12,989 patients and the presence of strabismus was found by parental questionnaire. Quality of life and mental health were investigated via a questionnaire.
- 959 Out of the 12,989 reported to have strabismus.

Results:

- Children with strabismus had lower scores:
  - Making friends
  - Social contact with classmates
  - Mental health problems
  - Hyperactivity/hyperactivity
  - Emotional symptoms
  - Peer problems

Conclusion:

- The study found impaired quality of life and mental health in children and young adults with strabismus.
Case 1: JK

- Age: 9 years old
- History: Patching and strabismus surgery at age 3 on right eye for esotropia. Now wearing flat-top bifocal with +3-50 add.
- Why use AT here?
  - Significant motion sickness and occasional double vision at distance. School reports poor attention/concentration. Right eye still tracking in and opthamologist recommends second strabismus surgery. Parent and patient do NOT want to have another surgery.
- Diagnosis: 40 Dioptr Intermittent Right Esotropia
- Refraction: OD: +2.85 sph OS: +2.00 sph
- Acuity: OD: 20/20 OS: 20/20
- VD: Right eye suppression beyond 1 inches
- Suppression during fusional vergence testing at distance and near
- Stereopsis: Distance None Near 80 seconds of arc

JK's Vision Therapy Goals

- 1. Reduce dizziness
- 2. To be able to keep his vision clear and intact
- 3. To improve attention and concentration
- 4. To be able to read in the car without motion sickness

JK's Therapy Pearls

1. MTF of OD with PTV at near, and MTF of OD with detailed videogame play in the distance
2. Application of visual function and near rehab with OD (Five troubleshooting ET)
3. Progress through the basics to tracking
4. Contrast and tracking good. However, JK still symptomatic with vestibular issues
5. High-level loading of Activities to integrate vision with vestibular, together and auditory systems

Modified VT Techniques for JK
JK's Outcome
- Cover Test: Distance 20 Intermittent Right Esotropia, Near = 6-8 Exophoria
- Worth 4 Dot: Fusion at all distances
- Distance Fusional Vergence Range: BI: x/y: 60/60, 6/0
- Near Fusional Vergence Range: BI: x/y: 15/60, 6/0
- Distance Stereopsis: 4-6 seconds of arc
- Near Stereopsis: 30 seconds of arc
- Most Important: ALL goals achieved!!

Case 2: HV
- Age: 29 years old
- Occupation: Dental Hygienist
- History: Bilateral strabismus surgery at 10 months old of alternating esotropia, patching therapy after surgery for many years. Told multiple times by many doctors that she is NOT a candidate for vision therapy.
- Why was HV here?
  - Very aware of crosstalk causing low self-confidence. Loses her place often while reading and prefers books on tape. Significant motion sickness also reported.
- Diagnostic: 40 diopter alternating esotropia (left/right) and large angle DVD at distance and near
- Refraction: OD: +1.25 sph OS: +2.25 sph x 155
- Acuity: OD: 20/20 OS: 20/20
- w/22: Alternating suppression at all distances
- Suppression during fusional vergence testing at distance and near
- Stereopsis: None at distance and near

HV's Goals
1. To be able to read without eyes hurting or watering
2. To make driving easier and more accurate
3. To improve her ability to watch, catch, or hit a ball
4. To improve her ability to play volleyball
5. To reduce or eliminate headaches while reading or using the computer

HV's Therapy Pearls
1. Home Video: Vision set at HV's angle
2. Develop diplopia awareness
3. Application of base in prism in conjunction with exo (base out) tracking
4. Use patient journal to help create activities targeted towards patients goals
Modified VT Techniques for HV

HV’s Outcome
- Distance Phoria: 0, Esophoria
- Near Phoria: 0, Esophoria, 2 base down OS
- Worth 4 Dot: Fusion at all distances
- Distance Fusional Vergence Range: BI: +0.50 EO: +2.25/4.25
- Near Fusional Vergence Range: BI: +0.50/0.50 OS: +1.50/4.25
- Distance Stereopsis: 0.30 degrees of arc
- Near Stereopsis: 200 seconds of arc
- Most Important: Significantly improved cosmesis leading to increased confidence and all of patient’s goals achieved.

Case 3: MC
- Age: 35 years old
- Occupation: College geography professor
- History: Started wearing glasses full time at 8 months old and began patching therapy. Strabismus surgery at 5 years, angle blend, left exotropia at age 13.
- Why was MC Here?
  - Very aware of cosmesis while teaching college students. Always struggled with sports and visualized from her entire life. His depth perception was while parking a car due to gauche she was left with.
  - Patient was referred to practice for your opinion when she was last told she needed to think of the visual effects that could be done. She has a history of left exotropia.
- Diagnosis: 30 Constant Left Exotropia and Left Hypertropia, Left Strabismic Amblyopia
- Refraction: OD: -6.33 -4.75 x 90 OS: -6.50 -4.00 x 85 Add: +3.50
- Acuity: OD: 20/20 OS: 20/20
- N4/D: Left suppression at all distances
- Suppression during Fusional Vergence testing at distance and near
- Stereopsis: None at distance and near
MC's Goals

1. To make driving easier and more accurate
2. To improve her ability to watch, catch, or hit a ball
3. To improve her peripheral awareness to a normal level

MC's Therapy Pearls

1. MFBR OS with Amblyopia Inet
2. Application of fresnel prism OS and begin exo (base out) tracking
3. Add tactile activities for better spatial awareness
4. As Amblyopia tracking progressed alternating suppression/diplopia occurred but awareness of eye alignment was poor
5. Used journal throughout to better coach and relate to patient in therapy

Modified VT Techniques for MC

- Distance Phoria: +5 Esophoria, 5 base-up OS
- Near Phoria: +10 Esophoria, 3 base-up OS
- Worth 4 Dot: Fusion at near and intermediate distances, occasional left suppression at distance
- Distance/Horizontal Vvergence Range: BI: +10/+30 BO: +10/+30
- Most Impressive: Significantly improved coursework, improved depth perception while driving, and now feels more secure. Has continued to work a VR exercise at home and is so pleased

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The patient progressed significantly in her therapy and is now able to drive safely and confidently. She has also reported a noticeable improvement in her coursework and overall spatial awareness.
Summary

- Traditional approach to strabismic patients is to eliminate suppression, and build sensory and motor fusion
- As VT providers we often measure success by improved alignment on cover test, increased fusional vergence ranges and improvement in arc seconds of cover
- The real key to success is ensuring the patient notes improvement in their visual abilities in life!
  - Have patient set goals
  - Check in with patient throughout therapy to discuss what they note in everyday life
  - Be creative with VT techniques to accommodate patient's individual goals/needs
  - Connect patients with others that are the same age with strabismus to create a strong support network
- Remember it's an emotional journey for these patients

Questions?