Slide 1

Vision Therapy Grand Rounds

MICHELLE J. BUCKLAND, OD, MS
CLINICAL ASSOCIATE PROFESSOR
CHIEF OF VISION THERAPY SERVICES

Slide 2

Disclosures

- none

Slide 3

Objective

- Discuss various vision therapy cases, including treatment plans for therapy.
- Strategies for working with more challenging patients and vision therapy techniques will be discussed.
Slide 4

**Frequency of Accommodative Disorders**

- Accommodative Disorders: 6-17%
- Accommodative Insufficiency
  - Prevalence: 2.3%
- Accommodative Spasm
  - Prevalence: 2%
- Accommodative Infacility
  - Prevalence: 1.5%
- Common Symptoms: asthenopia, blurred vision, headache

Scheiman and Wick

Slide 5

**Frequency of Binocular Vision Disorders**

- Convergence Insufficiency
  - Prevalence: 3-7%
- Convergence Excess
  - Prevalence: 1-8%
- Common Symptoms: eyestrain and headache, blurred vision, diplopia, sleepiness, difficulty concentrating and loss of comprehension over time, avoidance of reading/near tasks
  - CI: also movement of print and pulling sensation

Scheiman and Wick

Slide 6

**Frequency of Binocular Vision Disorders**

- In young children strabismus prevalence 3.7-5.3%
  - Esotropia 3x more often than Exotropia
- Intermittent Exotropia
- Basic Exo vs. Divergence Excess
- Accommodative/Refractive Exotropia
  - Uncorrected hyperopia, high AC/A or both
  - Average age range of onset 2.5-3 yo
- Infantile Esotropia
  - Of esotropias, 28-48% infantile

Moore, B.
Slide 7

**Vertical Phorias**

- Hyper/Hypophorias
  - Prevalence: 7-52%
  - Most latent
  - Symptoms: loss of place with reading, eyes tired, skip lines, slow reading, headaches, blurry vision, asthenopia, burning sensation

Scheiman and Wick

---

Slide 8

**Frequency of Oculomotor Disorders**

- Eye movement disorders:
  - 95% kids with learning problems, 24% with no learning problems
  - Often found in conjunction with accommodative and/or binocular vision problems
  - Symptoms: head movement, frequent loss of place, omission of words, skipping lines, slow reading speed and poor comprehension

---

Slide 9

**Vision after Brain Injury**

- Traumatic Brain Injury:
  - 90% manifest dysfunction of oculomotor system
  - Accommodative and vergence deficits most common

- Acquired Brain Injury:
  - 86.7% manifested dysfunction of oculomotor system
  - Strabismus and CN palsy were most common

Ciuffreda et al. Optometry
Vision Therapy

- The American Optometric Association affirms its long-standing position that optometric vision therapy is effective in the treatment of physiological, neuromuscular and perceptual dysfunctions of the vision system.

- Optometry: The Primary Eye Care Profession 2009.

What is Vision Therapy?

- Vision therapy is a sequence on neurosensory and neuromuscular activities individually prescribed and monitored by the doctor to develop, rehabilitate and enhance visual skills and processing.


Vision Therapy Can….

- Ocular motility dysfunctions (eye movement disorders)
- Non-strabismic binocular disorders (inefficient eye teaming)
- Strabismus (misalignment of the eyes)
- Amblyopia (poorly developed vision)
- Accommodative disorders (focusing problems)
- Visual information processing disorders, including visual-motor integration and integration with other sensory modalities
- Visual sequelae of acquired brain injury
Slide 13

Vision Therapy Can....

- Increases amplitudes of accommodation
- Increase accommodative facility
- Eliminate accommodative spasm
- Increase fusional vergence amplitudes
- Increase fusional vergence facility
- Eliminate suppression
- Improve stereopsis
- Improve accuracy of saccades and pursuits
- Improve stability of fixation

Slide 14

Qualities of a Good Vision Therapy Patient

- Willingness to work
- Ability of patient to perform tasks
- Able to commit to in office therapy
- Time
- Financial
- Attitude of change/Motivation
- Support (if needed)
- Setting realistic goals/Determining prognosis

Slide 15

Case 1: Convergence Insufficiency

- 40 yo female, stay at home mom/childcare giver recently went back to work in office. New job demands average 6 hours computer work per day.
- Symptoms: eye strain throughout day, headaches at end of work day, fatigue at the end of the day.
Phase 1: Gross/Voluntary Convergence
- **Brock String**: exercise 1-5
- Seeing physiologic diplopia -> NPC like activity -> jumps between 3 beads -> movement without beads = "bug on a string"
- Binocular push-ups
- Quoits ring for convergence
- Computer base out vergence

Case 1: Convergence Insufficiency

Phase 2
- **Barrel card**
- **Aperture Rule**: BO and then add BI
- Add in base in to vectogram activities
- Add in base in computer therapy
- Home: add in fixed (nonvariable) or variable red/green transglymph

Case 1: Convergence Insufficiency

Phase 3: "Jump vergence"
- **Vectograms** (2 vectograms or set of flippers)
- **Transparent lifesaver card**
- Jump duction on computer vergence
- Movement with vergence: saccades or pursuits added to task

Case 1: Convergence Insufficiency
Why In Office Therapy?

- The CITT study group found that in-office therapy was more effective than pencil push-ups and placebo therapy in the treatment of convergence insufficiency signs and symptoms.
- Results in office therapy more effective

**Results**:


Training convergence insufficiency in an adult?

Vision Therapy in Adults with Convergence Insufficiency: Clinical and Functional Magnetic Resonance Imaging Measures.


Case 2: Accommodative Insufficiency with Convergence Insufficiency

- Hx: 12 year old female with history of dyslexia diagnosis and academic difficulties.
- Symptoms: eyestrain, primarily with near work, headaches, photophobia. Exhausted at the end of the day.
Progression for accommodative therapy
- Kinesthetic awareness to increasing accommodative ranges to accommodative facility
- Traditional monocular and binocular move to binocular

Case 2: Accommodative Insufficiency with Convergence Insufficiency

Phase 1
- Lens Sorting: in particular clearing minus lenses
- Monocular push-ups
- Monocular far/near HART charts
- Loose lens rock
- Accommodative Rock on computer

Phase 2
- Monocular flipper added for home therapy
- Brock string
- Continue computer accommodative therapy
- Incorporate more plus lenses
- More emphasis on speed

With a vergence dysfunction involved we incorporated peripheral target vectogram therapy in office and at home.
Phase 3
- Integration of accommodative and vergence therapy
- Binocular flippers
- Binocular push-ups
- Brock String
- Adding more vergence activities.

Case 2: Accommodative Insufficiency with Convergence Insufficiency

Treatment of Accommodative Dysfunction in Children: Results from a Random Clinical Trial
- All groups performed better than the placebo group with office base therapy having the largest increase.

Case 3: Vision Sequela of Traumatic Brain Injury
- Dx: Accommodative Dysfunction
- Hx: 35 yo female police officer hit by a drunk driver 6 months prior to the vision evaluation
- Symptoms: Headaches in the back of head and behind eyes, loss of short term memory, difficulty focusing and concentrating, subjective loss of visual field on right side, photophobia, blurry, and difficult processing of information, writing and reading, leaves letters out in words. Also suffering from depression.
Case 3: Vision Sequela of Traumatic Brain Injury

- Modified therapy
- Dimmed lighting and therapy performed in an isolated area
- Fewer activities performed
- Accommodative Lens Sorting with 3 lenses
- Monocular Far/Near chart with enlarged print covering % of the chart
- Relaxing thru minus lenses
- Visual Perceptual: parquetry blocks (add in perceptual apps/websites for home)

Vision Sequela of Traumatic Brain Injury

- Challenges working with this population
- Photosensitivity
- Nausea
- Fatigue
- Frustration
- Sensitivity to movement
- Multiple therapies

Multi-Disciplinary Approach

- Physical/Sports Medicine
- Neuropsychology
- Speech Therapy
- Physical Therapy
- Occupational Therapy
- VISION……Optometry
Slide 31

**Multi-Disciplinary Approach**

- **OPINION STATEMENT**: Vision concerns after mild traumatic brain injury.

  "Mild traumatic brain injury (mTBI) can manifest with visual dysfunction including deficits in accommodation, vergence movements, versions, and field of vision as well as increased photosensitivity and a decline in ocular and overall health. Patients with comitant strabismus should be referred to an ophthalmologist for intervention.

  Patients with mTBI who experience photosensitivity, or deficits in accommodation, versions, vergences, or field of vision may benefit from vision rehabilitation. These therapies may include spectacles with tinting and a variety of prism combinations. Patients with chronic visual dysfunction following mTBI may benefit from occupational, vestibular, cognitive, and other forms of physical therapy."


Slide 32

**Case 4: “Mr. Right”**

- **Hx**: 10 yo male referred by primary care OD for convergence insufficiency. Mother thinks patient has eye issues. Patient does not report any symptoms.
- **Symptoms**: No headaches, eyestrain or blurred vision.
- **CISS 14**
- **Mother concerned regarding 3rd grade reading testing.**

Slide 33

**Case 4: “Mr. Right”**

- **FEEDBACK MECHANISMS**
  - SILO
  - Float
  - Localization
  - Parallax
  - Randot Targets: aperture rule, VTS4 system
  - Observation
Perceptual changes experienced with divergence and convergence demand increased with maintained fusion.

Float: convergence closer, divergence away
Part of SILO phenomenon
Localization
Pointing to where the target appears in space.

Convergence: target moves in same direction as the person
Divergence: target moves in the opposite direction as the person
Case 5: Intermittent Exotropia

- Hx: 9 year old female with a history of a longstanding intermittent exotropia. Parents are noticing an increased frequency in the tropia. Patient is doing well in school, but more of a reluctant reader than her brother.
- Increasing myopia
- Exotropia increases in frequency when under corrected
- Symptoms: none

Slide 38

- Suppression checks
- Therapy session 1:
  - Quoits ring: OD suppression
- Next session performed Peripheral Circles R/G, transpup (BC 45 series)
  - VTS4 MCV with stereopsis target
  - Brock String: working on phoria with glasses
  - Binocular Push ups with suppression checks
  - GTVT chart w/ Suppression checks

Slide 39

- Therapy at distance
  - Projected Quoits ring for convergence
  - VTS4 at increased viewing distance
Treatment of Intermittent Exotropia

- A systematic review of the effectiveness of treatments in altering the natural history of intermittent exotropia.

- "Given the limited evidence base, better designed studies are required to address the question of the most effective management for treatment of childhood X(T). Importantly, consensus is required on what constitutes a successful outcome as well as agreement on how this should be measured."


Intermittent exotropia: comparison of treatments.

- Surgery with preoperative orthoptic/occlusion therapy had the highest success rates. Surgery with orthoptic/occlusion therapy was more effective in reducing exodeviation (prism dioptres per millimetre of horizontal rectus surgery), compared with surgery only.


Treatment of Intermittent Exotropia: continued controversies and current management.

- Despite being less known and utilized, botulinum toxin and orthoptic therapy are options for treatment for intermittent exotropia and should be considered in appropriate patient's treatment protocols.

Case 6: accommodative spasm with convergence insufficiency

- Hx: 13 yo female with complaints of blurred vision at distance
- Symptoms: skipped lines occasionally, no diplopia or eye strain. Enjoy reading.
- Current specs 2 BI from primary care OD.

Therapy session 1: focus with plus lenses
- Lens Sorting
- Accommodative Rock with Loose Lenses
- VTS3 Accommodative Rock
- Relax thru minus
- Monocular accommodative push-ups
- ND: binocular far/near chart, plus side of flippers
- Encouraged reading with otc readers

Pre therapy Uncorrected DVA: 20/200 OD 20/100 OS
After therapy Uncorrected DVA: 20/20 OD OS

Progression:
- Added in more minus with plus lenses
- Added in vergence on VTS3 system (with accommodative target)
- Frost string
- Moved to binocular targets (far/near and push-ups)
- Vergence therapy with vectograms (clear and single)
- R/G flippers with r/g transglyph for jump therapy

Pre therapy by session 3 Uncorrected DVA: 20/20 OD OS
Case 7: Oculomotor dysfunction

- History: 56 year old female with complaints of poor depth perception and slow reading speed. Having difficulty keeping up with job requirements. Poor depth perception entire life. History of multiple traumatic brain injuries with 1 resulting in LOC and memory difficulties.
- ROS: +ADHD and anxiety
- History of Vision therapy in the early 1990s.

Key things to watch:
- Body movement
- Head movement
- Accuracy
- Catch-up saccades
- Accuracy of gross saccades then fine saccades
- Accuracy of fine pursuits then large pursuits
- Incorporate vergence (and accommodation) with oculomotor skills.

Phase 1: focus vergence and gross saccades and fine pursuits
- Brock String exercises
- VTS4 Multiple Choice Vergences
- VTS4 saccades
- HART chart for Saccades at distance
- Vectograms (emphasis on localization and awareness of JNDs)
- Tap the Number App
Case 7: Oculomotor dysfunction

- Progression: more oculomotor activities and vergence with some oculomotor
  - Dynavision
  - Marsden Ball
  - Keystone Adult comfort series for BO
  - Bernelloscope with Morgenstern series
  - Baseball saccades
  - Jumps between Vectograms

Case 7: Oculomotor dysfunction

- Progression: Oculomotor with Vergence Activities
  - Ann Arbor Letter Tracking → Sentence tracking
  - Multiple Brock Strings
  - Lifesaver card with Jump between targets → Rotation card
  - Spirangle with Saccades between letters → Spelling words
  - Marsden ball with metronome

Case 8: fusion therapy status post strabismus surgery

- Hx: 49 yo female s/p strabismus surgery at age 2 for exotropia
- Symptoms: difficulties with depth perception, occasional diplopia
- Patient had read the book Fixing My Gaze
Phase 1: Basic fusion techniques, Anti-suppression, Monocular Fixation in a Binocular Field (MFBF)
- W cheesercope
- Peripheral → Central/detailed targets
- Brock String working on physiologic diplopia
- VTS4 amblyopia task: MFBF
- Dynavision: MFBF
- Major Amblyoscope/Troposcope
  - fusion ranges with large second degree targets, peripheral suppression checks
Home Therapy: large GTVT started at near

Case 8: fusion therapy status post strabismus surgery

Phase 2: More Basic fusion techniques and continued Anti-suppression
- VTS4 flat fusion targets
- Red/green bar reader
- Major Amblyoscope/Troposcope
  - fusion ranges with large 3rd degree targets
  - Morgenstern basic fusion cards
- Home: small GTVT chart and red/green bar reader

Phase 3: Fusion with appreciation of Depth
- Major Amblyoscope/Troposcope
  - fusion ranges with large 3rd degree targets
  - Vectograms: observation of JNDs and disparity between targets
  - VTS4 vergence
- Home: continued Brock String, r/g tranglyphs r/g bar reader
Case 9: Vergence therapy with the inattentive patient

- Hx: 7 year old with mom noticing eye turning out more frequently.
- Patient had been noted to be a large exophoria since age 3 than started to become an intermittent exotropia around age 5.

Pre therapy values:
- DCT: 18 CAXT
- NCT: 20 IAXT (80%)

Traditional therapy:
- Brock String
- Binocular Push Ups
- Vectograms
- Passive anti-suppression
- TV trainer
- GTVT chart
- Red/green bar reader

Novel techniques: BO prism googles or loose with anti-suppression
- Ocuskill with r/g specs
- VTS3: therapist input answers to controller
- Wii sport with polarized suppression checks
- Eventually video games will balance issues in therapy
- Dynavision with BD once suppression was less common

Case 10: Oculomotor therapy after an acquired brain injury

- Hx: 26 yo with history of concussion secondary to an explosion
- Symptoms: eyestrain, blurry vision, photosenstivity, imbalance, difficulty tracking
- Patient had been referred to our clinic from the HIPP study