Prism Applications in Acquired Brain Injury

Why Consider Prism? When?

- Diplopia and/or Confusion
- Post Trauma Vision Syndrome/Disequilibrium
- Compromises in Visual Field
- Unilateral Spatial Inattention

Prism Considerations

- Compensatory vs. Therapeutic
- Full vs. Sector vs. Spot
- Ground vs. Fresnel
- Amount and Properties (yoked)
  - Integrative – less than 6PD
  - Disruptive – more than 6PD

Prism for Diplopia / Strabismus

- Why prism vs. patching?
- Recovery – how does it occur?
- Guidelines
  - Amount – Acute
  - Ground vs. Fresnel
  - Bilateral vs. Monocular application
  - Removal during recovery
  - Fixation duress
- Case Presentations
Can you wean compensatory prism?

Non-Surgical Treatment for Esotropia Secondary to Arnold-Chiari I Malformation: A Case Report.

Optometry 2009, 80, p.472-78.
(45°E to fusing 12 BI in 3.5 months)
16 months diplopic prior to start

Don’t forget the fusional vergences!

Jump Duction Therapy - Ludlam

Treatment for Diplopia - Overview

- Selective Occlusion – Complete vs. Sector
  - More likely start here with acquired paresis/palsy
- Prism – Use of compensatory, goal is to decrease over time, what if used and left on?
- Prism + Vestibular + Vergence Therapy = Modification of Vergence Adaptation
- Why different than simply prescribing what you measure?

Post Trauma Vision Syndrome (PTVS)

- A dysfunction of spatial vision involving orientation, balance, and convergent binocular function, hypothesized to result from damage to the midbrain ambient visual subsystem.

Tectal, Dorsal and Ventral Paths
Deficits Following TBI & CVA – Post Trauma Vision Syndrome

- Characteristics
  - Exotropia or High Exophoria
  - Accommodative Dysfunction
  - Convergence Insufficiency
  - Photophobia
  - Low Blink Rate
  - Spatial Disorientation
  - Oculomotor Dysfunction
  - Unstable Ambient Vision

- Signs & Symptoms
  - Diplopia
  - Objects appear to move
  - Poor concentration and attention
  - Staring behavior
  - Poor Visual Memory
  - Photophobia
  - Associated Neuromotor Difficulties
  - Balance, Coordination, Postural Control

Prism for PTVS

- Typically low base in prism (1-3 total)
- Convergence Insufficiency (CITT studies!)
- Ambient visual processing deficit
- Guidelines for trial framing and application
- Case Presentations

Binusal Occlusion-Motion Sensitivity

Effect of binusal occlusion (BNO) on the visual-evoked potential (VEP) in mild traumatic brain injury (mTBI).
Ciuffreda KJ, Yadav NK and Ludlam DP
*It is speculated that mTBI attempt to suppress visual information to reduce their abnormal motion sensitivity. BNO negates the suppressive effect, thus an increase in VEP and decrease in symptoms

VEP Without and With 2BI Prism

Prism for Visual Field / Visual Neglect

- Visual field cut / Hemianopsia
- Prism Systems – PELI, Gottlieb, Inwave
- Visual neglect / Unilateral Spatial Inattention
- Therapy approaches
- Compensatory prism
- Therapeutic prism

- What is most likely to recover ?
- What cerebral arteries are involved ?
- What cerebral lobes are involved ?
How does a visual field recover?

- Spontaneous Recovery
- Increased attention or microsaccades
- Decreased Swelling
- Other factors...
  - Automaticity of other skills
  - Surgical Anastomosis
  - Angioplasty

Visual Field vs. Visual Neglect-USI

- Visual field – Occipital Lobe
- Unilateral Spatial Inattention (USI) – Parietal, Frontal, Temporal Lobes
- Combinations
  - In General……..most don’t like using prism on compensatory basis, but use it on a therapeutic basis with unilateral spatial inattention, so test for it!
How do we tell the difference between Visual Field Loss and USI?

- Double simultaneous stimuli/dual extinction with confrontation testing
- Counting fingers motion vs. form
- Neglect is a competitive process
- Line Bisection
- Star Cancellation Task
- Draw a picture (clock)
- Observation and Report (location of lesion)

Line Bisection Crossout Task (Left USI-severe)

Star Cancellation Test

Draw a Clock – CW vs. CCW

Prism in USI – 2 Applications

- Compensatory vs. Therapeutic?
- Egocentric Localization – Karnath - BR
  - Shifts egocenter to midline, visual input
  - 2D, directional orientation
- Spatial Transformation – Rosetti - BL
  - Localization with visual, motor, vestibular
  - 3D, directional plus rotational
Egocentric Localization in USI

- Karnath found subjective (egocentric) localization was 15 deg to the right of objective center in USI
- Yoked Base Right shifted subjective localization (pointing task) to match objective center
- So should one consider prescribing Base Right prism in Left USI?

Prism Adaptation Therapy

- Most PAT treatments use Base Left, and include motor pointing tasks which become bimodal vs unimodal tx
- Rossetti (1998) found it lasted 2 hours vs. 10-12 min with caloric, cervical or okn stimulation, 50 reps-10deg prism
- Clinically, likely effects are cumulative, more sustained due to entrainment
- Compression in neglect, likely expansion after using prism base left

Rossetti 1989 study on yoked prism

- Prisms can be used for more than simply aligning eyes
- Set the stage for rehabilitative therapy, or simply provide a stimulus for recovery
- Can be helpful in many types of cases for different conditions...

Summary

- Diplopia, PTVS, Visual Field loss, and Postural

For More Information...

- Vision Rehabilitation Section of AOA
  www.aoa.org
- College of Optometrists in Vision Development
  www.covd.org
- Neuro-Optometric Rehabilitation Association
  www.nora.cc

Thank you for the opportunity to share with you!