Prescribing Prism Following Stroke and Traumatic Brain Injury
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Disclosure Statement:
Nothing to Disclose

Introduction

Why Consider Prism? When?
- Diplopia and/or Confusion
- Post Trauma Vision Syndrome/Disequilibrium
- Compromises in Visual Field
- Unilateral Spatial Inattention
- Posture and Mobility
- Reading – Bed Specs

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

Prism for Diplopia / Strabismus
- Why prism vs. patching?
- Recovery – how does it occur?
- Guidelines
  - Amount – Acute
  - Bilateral vs. Monocular application
  - Removal during recovery
  - Fixation duress
- Case Presentations
Non-Surgical Treatment for Esotropia Secondary to Arnold-Chiari I Malformation: A Case Report.

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

Treatment for Diplopia -

- Patch – Complete vs. Sector
- Prism – Use of compensatory, goal is to decrease over time, what if used in isolation?
- Prism + Vestibular Therapy
- Prism + Vergence Therapy
- Prism + Vestibular + Vergence Therapy
- 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.

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

Deficits Following TBI & CVA – Post Trauma Vision Syndrome

- 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

- Convergence Insufficiency (CITT studies!)
- Ambient visual processing deficit
- Esophoria and minus projection
- Guidelines for trial framing and application
- Case Presentations

Binasal Occlusion-Motion Sensitivity

Effect of binasal 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

Prism for Visual Field / Visual Neglect

- Visual field cut / Hemianopsia
  - Prism Systems
- Visual neglect / Unilateral Spatial Inattention
  - Therapy approaches
  - Compensatory prism
  - Therapeutic prism
- What is most likely to recover ?
- What cerebral arteries are involved ?

Field Enhancement

Peli System

Peli Prism – Case Report
Put back prism, but VF worsened!

How does it recover?
- Spontaneous Recovery
- Decreased Swelling
- Other factors...
  - Surgical Anastomosis
  - Visual Field and Language

Visual Field vs. USI
- Visual field – Occipital Lobe
- Unilateral Spatial Inattention (Visual Neglect) – 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 during confrontation testing
- Neglect is a competitive process
- Dual Extinction
- Line Bisection
- Star Cancellation Task
- Draw a picture (clock)
- Observation and Report (location of lesion)

Prism in USI – 2 Applications

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

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?

20% Horiz. Minification in Neglected Field

- Neglected Field
- Non-Neglected Field

Egocentric Localization vs. Spatial Compression/Expansion***

- Apex image appears larger, Base smaller
- With compression of left space with left USI, a Base Right prism may align the egocentric localization, but it may also be compensatory in nature, by expanding image size via the apex of the prism
- This may explain the discrepancy in some who respond differently to prism direction on a compensatory vs. therapeutic basis.

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, 30 reps-10deg prism
- Clinically, likely effects are cumulative, more sustained
- Compression in neglect, likely expansion after using prism base left
Rossetti 1989 study on yoked prism

Pretest to Posttest Pointing with PAT

PAT and Split Form Board-R vs. L Hand

Posture and Mobility

Karnath – Phil Trans Royal Soc 1997

“Normal” Responses to Yoked Prism
Postural Shifts Following a Stroke or TBI

- You fall to the weak side
- Then you adapt..shift center over stronger side
  - Begin to drift to stronger side, time factor
  - Often PT can help you straighten out
- But what happens with visual input?

Modification of Visual Input

- Consider Yoked Prism (<6PD, often 1-3)
- Compensatory vs. Therapeutic Approach
  - Kaplan vs. Kraskin Approach
- Prism provides directional and rotational component (spatial changes)
- Similar to use for USI/Visual Neglect
- *Always keep in mind…watch their EYES! This can often lead to a different response

Prism Base – Optical Field Distortion

Hemiplegia - Overview

- Arousal/Alertness
- Sensory/Motor Compromised? Neglect?
- Postural Tone
- Gait belt, Cane/Walker
- Weight Shift – front/back, R/L
  - Center of Gravity – maintenance
  - Temporal characteristics
  - Cocontraction- flexion/extension

Hemiplegia

- Postural Strategies
  - Fixing vs. Dynamic Weight Shift
  - Strategies for Balance
    - Foot, ankle, knee, hip, neck, arms, where to look
- Optometric Treatment
  - Vestibular
  - Yoked Prism
  - Field Cut – PELI perhaps
- Traditional Strategies
  - Orthotics, Electric Stimulation

Yoked Prism – Postural Effects

Modifying postural adaptation following a CVA through prismatic shift of visuo-spatial egocenter.
Padula WV, Nelson CA, Benabib R, et.al.
*Yoked prisms were used to facilitate recovery from a visual midline shift and improve orientation.
R hemianopsia into quadrantopsia
3 month VF - 8 weeks later with Peli

Bed Specs

Summary
- Prisms can be used for more than simply aligning eyes
- Set the stage for therapy, or provide stimulus for recovery
- Can be helpful in many types of cases for different conditions…
- PTVS, Visual Field loss, Posture, etc.

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!