Unique Vision Rehabilitation Solutions for Patients with Low Vision & Traumatic Brain Injury (COPE #4040)

Optometry’s Meeting
June 12, 2019, 9:00-11:00am
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Eric T. Ikeda, O.D.

Learning Objectives
- Low Vision (Dr. Winters)
  - Ocular health conditions resulting in visual impairment
  - Maximizing functional vision through contact lenses, vision rehab strategies (lenses, prisms, filters and selective occlusion)
  - Examination workflow
  - Cases
- TBI (Dr. Ikeda)
  - Common visual deficits (mbs, concussion, stroke)
  - Examination strategies
  - Optometric use of lenses, prisms, filters, and selective occlusion strategies
  - Cases
  - Provide available Resources

Overview
- Visit Strategies
  - History
  - Examination
  - Contact lens
  - Functional vision assessment
  - Vision rehabilitation
  - Referral
  - Follow-up
- Cases
  - Myopic degeneration
  - Glaucoma
  - Diabetic retinopathy
  - Pediatric Albinism/Congenital Nystagmus

Case history
- Visual difficulties
- Ocular/systemic history
- Medicaions
- Previous VR
- Use of prescribed/OTC devices
- Assessment psychosocial adjustment
- Occupational/educational history
- Avocation
- Social history/lifestyle
- Functional visual goals
- Contact lenses
  - Lens history
  - Specialty
  - Lens replacement
  - Residual/protective SRX

Examination
- Visual Acuity
  - Distance
  - Near
- Confrontation VF
  - Relative/absolute defect
- Trial frame refraction
- Ocular health examination/review
  - Review of diagnostic tests
Contact lens??
- Lens type
- Lens replacement
- Refractive limitations
- Other limitations
- Residual/protective SRX
  - polycarbonate

Testing
- Visual field
- Color vision
- Contrast sensitivity
- Glare

Visual field
- Kinetic
  - Extent of VF
- Automated
  - Humphrey
    - Sterman/52
    - 24 Point screener
- Amster Grid
  - Which one?
  - Threshold

Color Vision
- R+G vs B+Y deficit
- Congenital vs Acquired

Color deficiencies
- Congenital defects
  - Binocular vision
  - Hypo, hypermetropia
  - Night blindness
  - Macular degeneration
  - Cystoid macular edema
  - Systemic conditions
  - Congenital retinal anomalies
- Acquired
  - Can be progressive
  - Some may be reversible
  - Some may be nonprogressive
  - Some may be bilateral
  - Some may be unilateral
  - Some may be genetic
  - Some may be acquired

Testing
- Pseudochromatic plates
  - HRR
    - Tests R-G deficiency
    - Tests B-Y deficiency
  - Classification
    - M4
    - Moderate
    - Severe

Color vision
- Farnsworth D-15
  - Moderate, Severe color deficiency
  - If all correct
    - Mild color deficiency or non-color deficient
- Lanthony Desaturated
- Large D-15

Source: www.goodlite.com
Contrast Sensitivity

- Associated with
  - Reading performance
  - Ambulation mobility
  - Driving
  - Face recognition
  - Tasks of daily living

Contrast sensitivity

Contrast Loss: Vistech chart

- Typical loss in contrast sensitivity understood
  - Type 1
    - High contrast sensitivity loss
      - Cataracts, macular degeneration, etc.
      - Progress to type 2
  - Type 2
    - Contrast loss at all frequencies
  - Type 3
    - Reduced at lower frequencies
      - Glaucoma, diabetes, etc.

Other Contrast Tests

- Letters same size but contrast decreases
- Letters decrease in size but all low contrast

Letter size remains the same
Contrast reduced

- Pelli-Robison
- MARS

- Predict the special frequency curve
  - Use VA for high frequency point on curve
  - Result of test for low/medium special frequency
  - Peak of special frequency curve

Contrast sensitivity assessment

- Normal middle/young adult 1.72±1.92
- Normal >60 1.62±1.76
- Moderate CS loss 1.04±1.48
- Severe CS loss 0.52±1.00
- Profound CS loss <0.48
Reduce size of letter
Letters at same low contrast level
  • Low contrast distance acuity charts
    • Bailey-Lovie, EDTRS
    • Illuminated Cabinets/Charts

Vision Rehabilitation
  • Near devices
    • Traditional optical magnification
    • Electronic magnification
  • Distance devices
    • Lighting
    • Filters
    • Assistive technology

Cases
  • Myopic degeneration
  • Glaucoma
  • Diabetic Retinopathy
  • Pediatric Congenital Nystagmus

Laurencio- 37 yr old
  • Myopic degeneration

TODAY-- Laurencio- 37 year old
  • Has noticed decreased vision at distance
    • TV Menu not as easy to read
    • Seems to help to push glasses closer to face
  • Renew Drivers License
    • Daylight only
    • No issues with driving
      • Local
    • No difficulties at work or with near work

Laurencio-- 37 yr old
  • Past RX
    • OD +23.50+3.00x15 = 20/200
    • OS +23.00+4.00x85 = 20/20
  • Kinetic VF unremarkable
Laurencio - 37 year old

- Occupation: Works as a clerk at the Secretary of States Office
- Computer large print
  - Zoomtext
  - Removes SIEX for small print
- No issues
- Smart phone - Samsung Galaxy
- Large font

Contact lenses - discontinued

- Soft
  - In early 2000s not comfortable long-term wear
  - Hydrogel
- RGP
  - Issues - would pop out

Exam today

- Entering VA
  - OD: +23.59 D 1.0 x 015 20/200
  - OS: -23.00 D 1.00 x 165 20/80
- Refraction
  - OD: +23.75 D 1.0 x 015 20/80
  - OS: +25.50 D 1.00 x 175 20/80
  - Vertex 63 mm same as current

Ocular health

- Anterior segment - stable
- Posterior segment - stable
- OCT

IL DMV STDS

- Visual Field
  - Monocular
    - 20" temporal and 3" nasal
  - Binocular
    - 30" temporal
- Biopic Telescope
  - 3x non-focussable
  - 20/40 through telescope
  - 20/1000 carrier lens

Laurencio Contact Lenses - discontinued

- Scleral lens wear
- Improved VA in office but not in real world
- Dry Eye

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<th>SPH</th>
<th>BC</th>
<th>Dem</th>
<th>Ht</th>
<th>S/C-R</th>
<th>Edge</th>
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<td>-23.75</td>
<td>1.04</td>
<td>14.8</td>
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<td>Opti-xtra</td>
<td>SL-2x1.0</td>
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<td>LC-2x3.0</td>
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20/80 not 20/70

Options
- Driving Cessation
- Bioptic telescope
  - 20/100
  - 3/6 to 6/40
- Contact lenses
  - 20/70?

Bioptic
- Designs for Vision
- Ocutech
  - VES Mini
  - VES Explorer

Contact lenses
- Scleral
  - Soft
    - Hydrogel vs Silly
  - RGP

Topography

Monthly Soft CL
- Biofinity XR
  * +15 - +20
- Biofinity Toric XR
  * +10 - +10 sph
  * Up to +5.75 cyl
- OD: +23.75 to +0.00 x 0.15 20/80
- OS: +24.00 to +4.50 x 175 20/80
- OD: +18.50 to -1.75 x 0.15
- OS: +18.50 to -2.75 x 175
Biofinity Toric XR
- OD +18.50 ± 1.75 ± 0.15
- OS -18.50 ± 2.75 ± 2.75

- +10.00 ± 1.75 ± 10
- -10.00 ± 2.75 ± 2.75

- Glasses distance/protection
  - +10.00 sph 20/20
- Remove for reading fine print

Biofinity XR
- OD +18.50 ± 1.75 ± 0.15
- OS -18.50 ± 2.75 ± 2.75

- +14.50 sph
- -14.50 sph

- SRX FTW for vision and protection
  - +6.00 ± 1.75 ± 0.15
  - -6.00 ± 2.75 ± 2.75

To be continued....
- Distance
- Vision
- Driving
- TV
- Near
  - Computer
  - Removes SRX fine detail
- Protective Eyewear
- Comfort

Driving

Photo on Unsplash

AAF 50 yo Glaucoma- Helen M
- Open angle glaucoma
  - Latanoprost QHS OD, OS
  - Brimonidine timolol BID OD, OS
  - Stable with meds

Helen M
- VA cc
  - 20/60
- 20/50
- Visual field 24-2
- Depressed MD
- Suprinf arcuate
Helen M
- Doesn't like appearance of glasses
- Wants to be fit with CLs
  - Single vs. monthly XR FTW for protection
- Works as a cosmetologist
- Difficulty without glasses
- Uses iPhone
  - Larger text
  - Magnifier
- Notes takes longer to read than others
- Takes public transit
  - Some issues with signs

Children in band/marching band

Likes to Travel - Midwest

Cosmesis

Contact Lenses
- Daily
- Monthly
  - With peroxide cleaning
- Glasses for protection
- Insert 15 minutes after morning glc gtt
- Take out prior to evening glc gtt instillation

Helen M
- Refraction
  - +1.50 sph OD 20/60
  - +1.50 sph OS 20/60
- Add +3.00 -31.8M
- Add +2.50 -41.0M
Helen M
OD +2.75 MED add
OS +2.75 MED add
OD +2.75 Hi add
OS +2.75 Hi add
Plano polycarbonate SRX

HM 40 yo Glaucoma
Mild CS loss
Nasal loss
Arcuate

Reading
• Low magnification setting on phone
  • Larger FOV
• Reading glasses over CLs
  • PAL
• Visual Span

Telescope for distance spotting

Helen M
• Color Vision
  • D-15
    • Pass
    • Desaturated (w15w R-G) defect

By the way
• Sometimes I am surprised by hair color choices some of my clients prefer.
Color vision
- Educate on issue
- Seek help of colleague
- Use Iphone filters

Summary
- Daily multifocal SCL
  - Glasses for protection
- SRX for when not wearing SCL
- Telescope
- iPhone education
- Considering near device

Ruby W- 63 AA F
- Stable proliferative diabetic retinopathy
- Hx of ‘heavy PRP’
- Was told ‘nothing could be done’ to improve vision

Ruby W
- Side vision ‘weak’
  - O&M training
- Loves to knit and crochet
  - Can’t knit or crochet like she used to
  - Has tried all powers of over the counter glasses
- Lives in apartment next to her daughter
- No issues cooking/cleaning/ADL
- Grocery delivery service
- Retired
- Watches TV
- No issues

Knit Crochet
- What?
  - Big vs small
- Yarn type
  - What’s easier or more difficult
- Needle Hook size
  - What’s easier or more difficult
- Color yarn
  - What’s easier or more difficult

Knit Crochet
- Where
- Lighting
- Background
Knit Crochet
- Where
- Lighting
- Background

Ruby W – knit/crochet
- Sits in lounge chair or at table
  - Table lamp near chair
  - Ceiling light in kitchen
- Worsted thickness yarn (medium)
- Whatever hook or needle is around

Ruby W
- Reading
  - Large print Bible
- Samsung Galaxy
  - Phone, text, email
  - Larger font size
- Computer: Windows 10
  - YouTube video
  - Facebook

Ruby W
- VA entering/best corrected
  - OD 20/30
  - OS 20/30
- Confrontation Fields
  - Full face no finger counting

Refraction
- OD +0.25 sph 20/30
- OS +0.50 +0.50 x 180 20/30
- Holds reading material at 16 inches
  - +1.50 4/8 M

Amsler grid – OD, OS
Legally Blind
- Further testing??

Color Vision Testing
- D-15
- Large D-15

Contrast Testing – Severe Loss

Knitting or Crochet - Tried before didn’t help

Didn’t help

Lighting without Mag
Knit Crochet – Start simple – Limit goals

- Worsted – Bulky yarn
- Contrast hook/needle
- Contrast with background
  - Pillowcase
  - Cloth

Windows 10 -

Summary

- Contrast, color
  - Hobby
  - Apartment
  - TV
  - Computer, phone
- LET THERE BE LIGHT
  - Magnification decreases FOV
  - O&M

Albinism/Congenital nystagmus

<table>
<thead>
<tr>
<th>Affected</th>
<th>Unaffected</th>
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<tbody>
<tr>
<td>Visual acuity</td>
<td>Visual field unaffected</td>
</tr>
<tr>
<td>Variable</td>
<td>Color vision unaffected</td>
</tr>
<tr>
<td>Stereopsis</td>
<td></td>
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<tr>
<td>Contrast sensitivity</td>
<td></td>
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<tr>
<td>Photophobia</td>
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Devon 9 yo CM • First exam 5 yo through now

- Hx of congenital nystagmus/albinism
- Decreased vision, photophobia
- Systemic
  - RSV as an infant
  - Asthma
  - ADHD
- Not premature, 10 lb birth weight
- Meds
  - Concerta, Singular, Albuterol
Devon 9 yo CM - Refraction

- Hyperopia
  - +3.75 Sph OD, OS at 5 yo
  - +2.75 Sph, +0.50 Cy OS: 20/100
  - +2.75 Sph 20/100
- Poor responder

Devon 9 yo CM

- No stereopsis
- No obvious strabismus
- Cover test UTT
- Color vision = unremarkable
- Contrast sensitivity??

Devon – Through the years

- Ocular health consistent with oculocutaneous albinism
  - ERG
- Difficult to examine

Devon – First exam -through current

- SRX 'full time'
  - Transitions
- Vision Rehabilitation device
  - Questionable use

VR devices

Photo-phobia with Transition lenses
Photophobia with Transition Lenses

- Chadwick Leader

- Managing Two Pairs of Glasses

Devon – Through the years

- IEP
  - vision itinerant teacher; VR device use at school, preferential seating, caution gym since kindergarten

VR devices – Electronic vs Traditional

- Testing
  - Ideal vs Real life

VR devices – Electronic vs Traditional

- What does he do?
- What does he use?
  - Computer
  - Portable electronics
  - Smartphone
  - Video games

IEP - School but Home too

- Electronic magnification
  - Laptop/Desktop
  - Smartphone
  - Ipad

- Games

Current

- 2 pairs of glasses – FTW
- VR devices – dome mag and hhts
- Electronic devices
  - Enlarge text

REVERSE POLARITY
Management

- Proactive parent
- Goals
- Observation

Conclusions

- Goal oriented
- Work as team with other professionals
- Contact lenses for VI patients
- Functional Vision

Traumatic Brain Injury

➤ An insult to the brain caused by an external physical force, that may produce a diminished or altered state of consciousness, often resulting in an impairment of cognitive abilities or physical functioning.

➤ It can also result in the disturbance of behavioral or emotional functioning. These impairments may be either temporary or permanent and may cause partial or total functional disability or psychosocial maladjustment.

Incidence and Prevalence of TBI in the US (CDC report, 1999)

- Leading cause of death and disability
- Estimated 1.5 million
  - 230K hospitalized (survive)
  - 50K die
  - 80-90K long term disability
- Cumulatively 5.3 million living with permanent TBI related disability

Causes of TBI

- Risk highest among adolescents, young adults, persons older than 75 yrs
- Major causes:
  - Mva
  - Violence (assaults/domestic violence, gsw, shaken baby syndrome)
  - Sports injuries (concussions)
  - Workplace injuries
  - Falls (elderly)

Traumatic Brain Injury Act of 1996 Mandates

- CDC shall:
  - Develop a uniform reporting system for tbi
  - Conduct research into identifying effective strategies to prevent tbi
  - Implement public information
  - Provide technical assistance to public or non profit entities to plan, develop and operate projects to reduce the incidence of tbi
  - Present reports to Congress
Common Signs & Symptoms of TBI

- Physical
  - Double vision
  - Headaches
  - Balance problems
  - Light sensitivity
- Cognitive
  - Short term memory loss
  - Reduced information processing
  - Reduced multi-tasking
  - Spatial and organizational difficulties
- Emotional
  - Depression
  - Anxiety
  - Denial
- Additional symptoms
  - Blurred vision
  - Reduced or loss of visual field
  - Difficulty reading
  - Poor eye movements

Visual Challenges for the TBI Patient

Patients often report how their world became “scary” and uncertain place after their injury, especially after the recent onset of double vision and observe that what is know to be a stationary objects now appears to be moving in space.

Epidemiology of Stroke

(CDC data)

- About 795K people in the U.S. suffer a stroke
  - Initial 660k
  - Subsequent 185k
- 5th leading cause of death in the U.S.
  - 1 of every 20 deaths (540K Americans)
- Financial costs
  - $34 billion annually for health care services, medications, time off from work (long term disability)

Epidemiology of Stroke

- Highest among blacks
- Increasing in Hispanic population
- Although increases with age, it was reported in 2009 that 34% hospitalized were less than 65 yo

TBI Questionnaire

Provides important data and qualitative information for the consulting doctor
- Checklist - lifestyle format
- Specialists and therapists to contact
- Functional problems
- Patient’s goals

Why is Vision So Important?

Need
- It is the primary means in which we take in information about the world
- More than 50% of cerebral activity is related to vision!
- Studies have shown that 50-75% of individuals with acquired brain injury have visual impairments

Gap
- Vision impairments are very frequently overlooked
- Many occupational therapists do not feel equipped to treat vision impairments
- For quality care, it takes an interdisciplinary approach

Berthold-Lindstedt et al. (2017)
“What we observe is an external representation of the internal organization of the individual”

As optometrists, we have many tools that we have learned which frequently help create a better environment for our patients. Those tools include, lenses, prisms, filters, and selective occlusion.

Neuro Optometric Examination

- HPI, reports from neurologist, etc.; current therapies
- Ocular motilities (King Devick, DEM, Visagraph, Readalyzer, Righteye); coordination
- Posture, gait
- Spatial orientation and organization (visual midline, visual spatial mapping, prism test)
- Auditory visual motor integration
- Contrast sensitivity
- Electrodiagnostics (VEP)

Unique Optometric Solutions for the TBI patient

Neuro Optometric Rehabilitation

- Therapeutic prescribing of lenses, prisms, filters, selective occlusion
- Vision Therapy
  - Visual efficiency skills, binocular skills
  - Visual perceptual motor skills
  - Visual vestibular skills (vestibular visual motor)
  - Interactive Metronome, RightEye
Creating A New Foundation for the TBI Patient

No longer is that patient able to read without getting a headache and the lighting in the room has become very uncomfortable.

Creating an Important Foundation For the TBI Patient

Providing the best prescription lens can often help alleviate some symptoms, but more importantly, it can provide the individual a support base support to allow for rehabilitation.

Spatial Characteristics of Lenses

<table>
<thead>
<tr>
<th>(+) Plus Lens</th>
<th>(-) Minus Lens</th>
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<tr>
<td>- Reduces tonicity of postural musculature, back and neck</td>
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<tr>
<td>- Expands visual space volume</td>
<td></td>
</tr>
<tr>
<td>- Emphasizes background (as opposed to figure)</td>
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Understanding Prisms

- What are prisms used for
- How prisms work
- Distortion of Space (bending space)
- Physical Shifts

Resolution of Diplopia with Prism Correction

- Ground in prism (ground in up to 10 diopters)
- Fresnel prism (reduction in acuity)
- Rehabilitation Program to improve binocularity (incorporates vision therapy)

Spatial Characteristics of Prisms

- (<) < 0) Base In
  - Moves visual space outward
  - Reduces tonicity of postural musculature or upper back and neck
  - Expands visual space volume
  - Emphasizes background (as opposed to figure)

- (>) > 0) Base Out
  - Moves visual space inward
  - Increases tonicity of postural musculature of upper back and neck
  - Reduces visual space volume
  - Emphasizes figure (as opposed to background)
NON-YOKED Prisms

- Base-in prism
  - object appears bigger and further
  - shoulders move back
  - special considerations with TBI patients, increased VEP amplitude
- Base-out prism
  - object appears smaller and closer
  - shoulders move forward

Spatial Characteristics of Yoked Prisms

-(△△) Base Down
- Moves visual space upward, farther from one's center of gravity
- Gives effect of looking "uphill", relocating space away with objects seen as "larger"
- Creates postural change:
  - Eyes move upward
  - Chin moves upward and outward
  - Center of gravity shifts forward
  - Pelvis shifts to tilt downward
  - Body moves forward on toes
  - De-emphasizes figures and emphasizes ground, making the individual to function more "laterally"

-(△ ) Base Up
- Moves visual space downward and in toward one's center of gravity
- Gives effect of looking "downhill", re-locating space inward with objects seen as "smaller"
- Creates postural change:
  - Eyes move downward
  - Chin moves downward and inward
  - Center of gravity moves backward
  - Pelvis shifts to tilt downward
  - Body moves back on heels
  - De-emphasizes ground and emphasizes figure, enabling the individual to function more centrally

Response from BD yoked prism

EXPECTED RESPONSES

subcortical responses (Wisconsin Am 97)
- eyes down and in
- weight shifts posteriorly
- resilience shifts down
- moves on toes
- falls forward

- balance and postural shift in position
- movement in space and depth

cortical responses (Wisconsin Rx 97)
- space contracted at base, expanded at distance
- perceptions downward tilt

- problems dizziness

Effects of Yoked Prisms

Where Am I Pathway (spatial)
Brainstem, cerebellum and limbic system
- Yoked Base Down
  - Shifts eyes up and out
  - Expands space
- Yoked Base Up
  - Shifts eyes down and in
  - Constricts space

Effects of Lateral Yoked Prisms

Where Am I Pathway (spatial)
Brainstem, cerebellum and limbic system
- Yoked Base Left
  - Eyes shift right
  - Rotates the body right
  - Expands space to the left
- Yoked Base Right
  - Eyes shift left
  - Rotates the body left
  - Expands space to the right

Determining the Lens Prescription

- Consider SV Rx for distance and SV Rx for near point work
- Trial frame potential Rx
- Direct the patient to walk with the trial frame Rx, giving the patient a specific path to walk (include obstacles)
  - Note the head position, posture and accuracy on turns
- Observe how the patient navigates in narrow spaces
- Be sure to trial the following when appropriate
  - Binasal occlusion
  - 1 base in prism
  - Yoked prisms (several orientations)
- Determine the final prescription after the testing is completed.
Case Studies

TBI patient with Intermittent Exotropia

- Exotropia at near measured 2 base in to fuse with the Red lens test (9 positions of gaze)
- Trial framed prism 2 base in provided fusion in free space
- Patient reported feeling more comfortable with reading tasks and while walking with the prism Rx

Yoked Prism for VMSS

- Video

Prism Rx for Visual Midline Shift Syndrome

- Common problem of TBI is the Visual Midline Shift
- Affects balance, posture and gait
- Yoked prisms are useful to improve visual spatial concerns
- Orientation of the base of the prism is in the same direction for both eyes

Epidemiology of Stroke (CDC data)

- About 793K people in the U.S. suffer a stroke
  - Initial 60K
  - Subsequent 833K
- 5th leading cause of death in the U.S.
  - 1 of every 20 deaths (140K Americans)
- Financial costs
  - $54 billion annually for health care services, medications, time off from work (long term disability)

Causes of Stroke (American Heart Association)

- A cardiovascular disease affecting the blood vessels that supply blood to the brain (also known as a “brain attack”)
- Occurs when the blood vessel “bursts” (hemorrhage) or is “clogged” (ischemia) depriving the brain of oxygen
- Two types of hemorrhagic and two types of clots
  - Cerebral and subarachnoid hemorrhages (higher mortality rate)
  - Cerebral thrombosis and embolism (most common representing ~75% of all strokes)
34 yo female, cerebellar stroke

- Dizziness, nausea, HA
- Lived alone
- Worked at Farmer John on the factory line, aerospace company building/assembling interior of airplanes
- Financially supported her family
- Enjoyed being a “homebody” on the weekends, drawing, painting, and bike rides with friends
- Main goal: return to work

Case Study

- At initial out-patient vision screen: (6 months after onset)
- Subjective:
  - Wore glasses since childhood, has recent Rx
  - Intermittent blurry vision
  - Seeing double movement on left side when nothing was moving
  - Walking crooked
  - Dizziness
  - HA (affecting her ability to volunteer, take public transportation)
  - Watery eyes
  - Get in the habit of moving her whole body, instead of her head or eyes after the stroke to limit dizziness (therefore maintaining a central gaze)
  - No longer working, riding her bike, drawing, or painting

Case Study

- Objective:
  - Sinusotopic gaze (intermittent, inconsistent)
  - Ocular ROM
    - Full both eyes, but at inability uncomfortable (causing with effort, tending)
    - Repetitive double vision particularly end ranges, all fields
  - Acuity
    - 20/200 both eyes, but with a lot of effort / eye
    - Periperal fields: WNL but straining
  - Home program:
    - Monocular ROM verbally easier than binocular ROM

Case Study

- Neuro Optometry Clinic:
  - Much was happening as noted with binocular ROM, after just a few days of doing monocular ROM
  - O.D. recommended working on increased peripheral orientation awareness, in the central’s focused
  - Presented a mirror skewed prism, help the eyes with binocular ROM and (vision) activities.
  - Patient dizziness might get worse before it gets better
- Treatment Phase:
  - Continue with monocular ROM
  - Binocular ROM with prism (swinging, then standing)
  - Change prism orientation (swinging back and forth, throwing catching a ball, shaving, free money, walking, etc.)
- Progress:
  - Decreased dizziness
  - Normal vision of single vision
  - Increased amount of work volunteering at elementary school
  - Aids

Case Study

- Treatment Phase 2:
  - Decreased, then discontinued use of prisms when pt no longer reporting dizziness and
  - prisms made therapy activities too easy
  - Began working on binocular ROM focusing on binocular fixation (focusing mostly on end
  - ranges where pt still seeing double or GVS
  - Continued with peripheral orientation activities without prism
- Progress:
  - No longer reporting double vision, but still has blur at end ranges, especially vertical
  - ranges (superior/inferior)
  - Dizziness resolved
- Follow Up in Neuro Optometry:
  - O.D. found hypertropia
  - Prescribed a prism (stereotactic prism) to wear up or down during dynamic activities and
  - binocular fixation to change the way the visual information is being interpreted – force the brain to hyperfucence (left)

Case Study

- Treatment Phase 2 (continued):
  - Followed same treatment plan but added in a dioptric sized prisms base-updown
  - Decreased prisms when activities become too easy with them (e.g., no blurry, no eye
  - shake)
- Progress:
  - No double, still with blur at end ranges (able to fuse)
  - No dizziness, HA only when doing up close work
  - Pt starts working as a community representative at the elementary school
  - Considering discharge from OT soon
  - (2) sized prisms at distance (5 feet) = Pt reporting intermittent blur (especially after a
  - few seconds of fusion, indirect view of fatigue) and double at end ranges
- Treatment Phase 2 (continued):
  - Binocular fusion activities with block string, BTT with targets for away (first standing,
  - then balance board, then while moving), RHF, if not target tracking withagnl.
Case Study

- **Progress:**
  - Pt reports eye fatigue and blur at work (especially with computer work and looking at power point presentation during meetings)
  - Stopped doing most of her HEP due to feeling visually fatigued after work
  - Follow up at Neuro Optometry Clinic
    - Recommend removing glasses when doing computer work
    - Continue with binocular fusion at end ranges (distance)
    - Start convergence training without glasses (pt found how convergence insufficiency without glasses)
- **Treatment Phase 3**
  - Near/fusional枕头 and hand chart
  - Binocular fusion (and ranges) with block string, moving hand charts
  - Adult portion of computer: modify positioning during meetings
  - Convergence training with block string
  - Adapted cycling, then if ready bicycling
  - Walking and turning head without bumping into objects

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20 yo male basketball player, multiple concussions

- First time vision exam
- Go blurry vision, "turning off", tendency to bump into people/objects
- Unaided visual acuities: 20/25 each eye (distance), 20/30 each eye (near)
- VisualFields full (automated)
- Ocular motility full
- Color vision testing: no misses
- NPC: no blur, 1st break, 3rd recovery (x3)
- Cover testing: intermittent exotropia (right eye preferred)
- Exophoria: not at distance and near (basic exo) with reduced base out recovery endpoints.
- Accommodative amp 15O
- Visual spatial map showed a left rotation shift

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Visual Ocular Motor Screening

- 5 domains evaluated:
  - 1. smooth pursuit
  - 2. horizontal and vertical saccades
  - 3. NPC
  - 4. horizontal vestibular ocular reflex (VOR)
  - 5. visual motion sensitivity (VMS)

- VOMS "may augment current assessment tools and serve as a single component of a comprehensive approach to the assessment of concussions"

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RightEye

- Cloud based computerized vision screening
- NeuroVision Tests
  - Circular Smooth Pursuit
  - Horizontal & Vertical Smooth Pursuit
  - Horizontal & Vertical Saccades

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Types of Occlusion Used with TBI

<table>
<thead>
<tr>
<th>Type</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot Patch</td>
<td>eliminates diplopia</td>
</tr>
<tr>
<td>Inferior Sector</td>
<td>eliminates diplopia</td>
</tr>
<tr>
<td>Binasals</td>
<td>reduces confusion</td>
</tr>
<tr>
<td>Combination</td>
<td>reduces confusion and diplopia</td>
</tr>
</tbody>
</table>

*Alternative: Bangerter foil (translucent, allows light to filter in)
Selective Occlusion

- Binasal occlusion
- Spot occlusion

Binasal Occlusion

- Occlusion of a small area over nasal retina on each eye for the purpose of reducing the amount of ambient light.
- The decrease in ambient light in the nasal retina reduces the confusion that exists from the binocular system.
- The effect of the binasal is to help balance the peripheral (ambient) system with the central (focal) system.

Filters

- Changes the energy of the light hitting the retina
- Light sensitivity
- Confusion
- Contrast enhancement
- Reading improvements

Filters Used with TBI

- FL-41
- For light sensitivity, recommended for patients with migraines, post concussion syndrome
- Filters blocking portions of the blue spectrum
- Anifra tint* 
- Blue/green 20 to 30%
- Green/blue 20 to 30%

*SUNY study: Critical Flicker Frequency and Related Symptoms in MTBI. 2008
Note: filters should be ordered from a reliable source that controls the transmission and wavelength of the specific filter.

Specific Task Considerations

Does Your Prescription Meet the Patient’s Needed Requirements?

- Mobility – navigation skill, balance and timing
- Driving – peripheral awareness
- Reading – accommodative and binocular control and stamina
- Data devices, laptops, tablets, desktop computer – sustained attention

A majority of TBI patients benefit from single vision lenses

Monitoring Changes with Lens Prescriptions

- Responses and over time
- Lens modifications (prism changes)
- Repeat testing (binocular)
- Probing for changes
- Let the patient know that the prescriptions will change frequently and require monitoring
Prescription Interventions

Training Resource Organizations

- American Optometric Association (AOA.org)
- College of Optometrists in Vision Development (COVD.org)
- Neuro Optometric Rehabilitation Association (noravisionrehab.org)
- Optometric Extension Program Foundation (OEPF.org)