Acquired Brain Injury - A Case Based Approach

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Optometry’s Role – The Past

• Until about the mid 1980’s
  • we just didn’t see these people or if we did it was only to get them new glasses after they had recovered.
  • Until this time we didn’t see many of these because plain and simple most of them died.
  • Modern medicine is keeping them alive and some recover enough to seek out optometric services.

Optometry’s Role – The Present

• We are now getting involved earlier and earlier with an ever more broadening scope.
  • Rather than being peripheral to the medical care of these patients we are now becoming an integral part of their health care team.
  • This means getting involved directly with many other health care practitioners.

TBI Incidence

• Every 15 seconds, someone receives a head injury in the United States.
• Every five minutes, one of these people will die and another will become permanently disabled.
• One of every five survivors suffering head injuries are under age 50.
• Young men are more than twice as likely as women to suffer head injuries.
• Only one head-injured survivor in 20 is receiving appropriate rehabilitation today.

Who are the patients that optometrists work with?

| Craig et al. SUNY College of Optometry |
| 220 patients with ABI |
| 100-TBI, 0-CVA |

<table>
<thead>
<tr>
<th>Age Range</th>
<th>TBI</th>
<th>CVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-11</td>
<td>24-90</td>
<td></td>
</tr>
<tr>
<td>12-17</td>
<td>10-150</td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>1-10</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Year postinjury Range</th>
<th>0.1-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number with multiple TBI</td>
<td>52</td>
</tr>
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</table>
What other services are they getting?

<table>
<thead>
<tr>
<th>TBI</th>
<th>CVA</th>
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</thead>
<tbody>
<tr>
<td>Physical Therapy (57.5%)</td>
<td>Physical Therapy (75%)</td>
</tr>
<tr>
<td>Cognitive Therapy (36.9%)</td>
<td>Occupational Therapy (60%)</td>
</tr>
<tr>
<td>Occupational Therapy (30.8%)</td>
<td>Speech Therapy (53.3%)</td>
</tr>
<tr>
<td>Speech/Psychosocial Therapy (26.7%/28.8%)</td>
<td>Cognitive Therapy (20%)</td>
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</tbody>
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What are the most common symptoms?

<table>
<thead>
<tr>
<th>TBI</th>
<th>CVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Balance (58.1%)</td>
<td>Loss of Balance (55%)</td>
</tr>
<tr>
<td>Dizziness (56.3%)</td>
<td>Dizziness (31.7%)</td>
</tr>
<tr>
<td>Vertigo (28.1%)</td>
<td>Vertigo (15%)</td>
</tr>
<tr>
<td>Motion Sickness (7.5%)</td>
<td>Motion Sickness (1.7%)</td>
</tr>
<tr>
<td>Eyestrain with Near Vision Tasks (51.9%)</td>
<td>Near Vision Blur (43.8%)</td>
</tr>
<tr>
<td>Increased Light Sensitivity (49.4%)</td>
<td>Eyestrain with Near Vision Tasks (38.3%)</td>
</tr>
<tr>
<td>Headaches with Near Vision Tasks (44.4%)</td>
<td>Distance Vision Blur (31.7%)</td>
</tr>
</tbody>
</table>

Visual Symptoms

“I just don’t feel like myself…”

- Blurred vision
- Diplopia
- Loss of place
- Bumping into things
- Difficulty with concentrating on reading tasks
- Dizziness
- Poor balance and coordination

Optometric Assessment

To evaluate the three key areas of vision: **acuity, sensory motor and perception**

1. Case history- COVID checklist
2. Observation – head side, non-comitant deviations
3. Eye Movements: King-Devick, NUSCO, ductions, versions
4. Motor Alignment: CT and/or Maddox rod.
5. Accommodation (critically): amp, near retinoscopy, facility, NRA/PRA, AC/A

Optometric Assessment

1. Visual perceptual testing
   - Visual motor integration
   - Pegboard
   - Test of Visual Perceptual Skills
   - Gardner’s Test for reversals
   - RAN/RAS-automatity
Optometric Assessment
Sequence of Management

Correction of Refractive Error
- Added lens power
- Prism (H, V, O)
- Occlusion
- Vision Therapy
- Surgery

Case 1: Visual Field Issues

60 year old white female
History of 2 CVA's 3 months prior
She was referred from her nephew who is a 4th-year student at SCO
Complained of having to turn her head to the left of midline to see objects
She could not read for even short periods of time, had headaches, and motion sickness
Her private optometrist had not referred her for any further treatment.

Visual Field Issues

• 7/20/09 Diagnoses
  • Saccadic Eye Dysfunction
  • Visual Field Defect OD, OS
  • Convergence Insufficiency
  • Intermittent alternating exotropia

Visual Processing was normal

Treatment and Goals

• Treatment:
  • Best corrected glasses at distance and near
  • Vision Therapy estimated 15-20 sessions.

• Therapy Goals
  • Improve visual attention
  • Improve jumping eye movements
  • Improve binocular vision

Vision Therapy - Goal

• To reduce effort necessary to process visual information and improve accuracy and flexibility of visual system....
Vision Therapy

- Same core concepts
- Controlled environment
- Prof. supervision
- Specific techniques to stimulate neurons assoc. with visual functions
- Limited in restoring visual function completely

Vision Therapy

- Oculomotor: stressing accuracy and equal (close to equal) eye movements
- Accommodation: monocular to binocular, then integrate with vergence...
  - Speed, accuracy, stamina, sustainability then flexibility...emphasize on size and distance
  - Changes, eye feelings

Vision Therapy

- Focused Training...start where fusion meets least resistance then where fusion is difficult/absent.
  - Goal, may not be single clear comfortable vision, but fusion free of diplopia out of
  - Instrument with suppression or diplopia in instrument…
  - Go from large peripheral objects to smaller central ones.
  - Large stereoscopic targets give strong fusion lock (peripheral retinal areas)

Vision Therapy

- The use of VT with prisms is very helpful!
  - Can be monocular or binocular
  - Expand field awareness
  - Increase fusional capability
  - Shifting visual space
  - Disrupt perception

Treatment Outcome

- Improvement seen much quicker than anticipated
  - 12 sessions completed
- Original diagnoses - All reduced or eliminated
  - Visual Field Defect
  - Significant visual acuity loss
  - Strabismus
  - Convergence Insufficiency
  - Before: intermittent alternating exotropia, reduced stereopsis
  - After: low exophoria, improved stereopsis

7/20/09   11/3/09   6/15/10
Case 2: Lightning Girl

- 18-year-old African American female was struck by lightning while walking home from school (7 months prior to exam)
- Lightning entered her side and exited through her feet.
- Patient was found unresponsive, MD presumes her heart stopped beating for 20-30 minutes.
- Patient was in a coma for 5 weeks and was in multiple hospitals for 3 months.
- Released from hospital and now attends outpatient rehabilitation 3-days/week.

History

- Referred by local outpatient rehabilitation facility, presumed visual deficiencies noticed in therapy activities.
- Patient Ocular History:
  - (+) nearsighted, has worn glasses for years
  - 2 post-incident exams by ophthalmologists, all findings WNL, “vision is good enough to drive again”

Chief Complaints:

- Patient's mother feels her depth perception “is off.” Notices when reaching for objects and during physical therapy walking exercises.
- Patient reports she no longer enjoys reading (her once favorite hobby) because of her visual problems.
- (+) blur at near with glasses
- (+) intermittent horizontal diplopia, distance and near

Objective Findings

- Distance VA: OD: 20/25
- OS: 20/20
- OU: 20/20
- Single letter and someone pointing at the letter.
- Near OD: 20/20 (at 40cm)
- Cover Test Distance: IAXT 18Δ, 70% frequency
- Near: 18Δ XP, poor fixation
- Stereopsis:
  - (-) Stereo F and (-) Keystone Basic Während (KBB)
- Confrontation Visual Field:
  - Significantly restricted

Refraction

- Manifest Distance Refraction: no change/improvement from habitual
  - OD: -0.50 -1.00x055
  - OS: -1.50DS
- Manifest Near: prefers +1.00 over habitual
  - 20/25 OU (at 40cm)
  - Trial frame: HUGE smile!

Goldmann Perimetry

- OD: 10-degree horizontal static field
- 25-degree horizontal dynamic field
- OS: poor response to horizontal static field
- 30-degree horizontal dynamic field
Visual Field and Gait

- Patient hunched forward and takes small "shuffle steps."
- Demonstrated fixation down yoked prism.
- Positive response! Patient stood taller and walked with more confidence. Gait was noticeably improved.
- Depth perception in reading for objects also improved.

Assessment & Plan

- 1) Constricted Visual Field OD, OS secondary to TBI
  - 6Δ base down yoked prism glasses to be used during therapy activities only (to avoid prism adaptation).
- 2) IAXT secondary to TBI
  - Initiate Vision Therapy.
- 3) Accommodative Dysfunction OU secondary to TBI
  - Release Rx for near vision only.
- 4) Perceptual Dysfunction secondary to TBI
  - Initiate Vision Therapy.

Treatment Approach

- Perceptual first
  - Rhythm - simple clapping to a beat
  - Hand - eye coordination pegboard, SVI
  - Visual Memory - using letters, shapes, colors and Visual Spatial Skills - parquetry blocks
- Strabismus second
  - Suppression - TBIT, OEPF
  - Strabismus grid started 18 months into VT
  - Currently, we are about 3/5 done.
  - Started about 6 months ago with Fresnel prism to spur on binocularity. 15 BI down to 10 BI OU.
- Integration third
  - Activities that stimulate perception and vergence/accommodation
  - Computer based programs such as Vision Builder and CPT
  - MFBF Matching Game
  - Spelling game while doing congoons.

Goldmann Perimetry

A Break Through!

- Comes in one week without Fresnel Prism
  - It doesn't work! Anyone. I don't see double.
- Covers Tatt
  - 1.5 P at distance
  - 12/14 NP at near
- Cover 1 P Clear
- 5 dots
- No suppression during therapy session with bar reader and flippers
- Appreciates SILO on Quiot vecto and localizes letters on the Clown vecto
- When asked if she knows what her eye is pointing out, she replied, "Yeah, I just bring it in!"

The Patient in Action
Back from the Dead

Perceptual Issues

CI with a Twist

A Work in Progress

- 56 year-old female
- Status post surgical removal of meningioma
- During surgery: Left PCA infarct
- Patient complains of ptosis and diplopia
- Examine findings:
  - Pupil: smaller OS in light and dark
  - Full range of motion OD, OS
  - Ptosis OS

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A Work in Progress

- When OS lid is picked up, pt reports letters become double - now seeing two letters 3 inches apart from each other, one central and one down and to the right
- Pupils: Anisocoria noted greater in dark than light, ( ) APD
  - OD: 4 - > 2
  - OS: 2.5/2.75 - > 2
- Apraclonidine 0.5% instilled at 11:45am OU
  - OD: 4 - > 2.5
  - OS: 4 - > 2.5
- Appears to be a positive Apraclonidine test

Diplopia Evaluation

- Patient reports diplopia with OU. Right eye image is straight. Left eye image starts with right eye image but then slants downward.

Short Term Stabilization - Long Term Gain

When All Else Fails - Spot Occlusion

Thank You

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