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Abstract
Individuals with traumatic brain injury (TBI) often experience dizziness, disequilibrium and imbalance. This poster presents a 37 year-old female with TBI who developed disequilibrium symptoms exacerbated by convergence insufficiency and binocular instability.

I. Case History

- 37 year-old Middle Eastern female (TE)
- Chief complaints: moderate dizziness, blurry vision at near and reading difficulty since motor vehicle accident
- Ocular history: compound myopic astigmatism OU
- Medical history:
  - TE was in a car accident where she was sitting behind the driver when the driver lost control of the vehicle.
  - No report of loss of consciousness, but patient suffered a TBI and many broken bones.
  - Type of rehabilitative services received: one year of physical therapy, three months of occupational therapy and several sessions of emotional regulation group therapy
  - No known systemic diseases
- Medication: Amitriptyline HCl 10 mg

II. Pertinent findings

- Refraction: OD= -2.25 -0.50 x 175 20/20
  OS= -2.50 -0.50 x 005 20/20
- EOM: full, smooth & comitant
- Pupils: ERRL (-)APD
- CVF: Full to finger counting OD/OS
- Stereopsis: 250” with Randot stereo test, 40” with Wirt circles
- Near point of convergence: 6”/6”, slight motor overflow to regain fusion at 6 inches
- Distance lateral phoria: 6 eso, iso
- Distance vergences: BI: x/8/1, BO: x/20/12
- Near lateral phoria: 3 exophoria, iso
- Near vergences: BI: 16/18/8, BO: x/30/14
- Accommodative amplitudes: OD= 6.50 D, OS= 5.75 D
- Scans: MRI and CT scans unremarkable
- Patient reports 3 (greatest severity) in areas of disequilibrium, reading problems, visual concentration, and balance in the Post-Traumatic Vision Syndrome (PTVS) Symptoms Survey
III. Differential diagnosis

- Dizziness and disequilibrium are some of the most common complaints in patients with TBI.
- Thorough history and clinical examination are required to rule out potentially life threatening etiology.
- Differential diagnoses:
  - Diffuse axonal injury affecting higher level processing and/or dorsal stream
  - Inner ear vestibular problems
  - Autoimmune or Lyme disease
  - Brain tumors

IV. Diagnosis and discussion

1. Convergence Insufficiency/Binocular Instability
2. Visual-Vestibular Dysfunction with associated symptoms of disequilibrium

- TE symptoms for CI included difficulty reading and blurry vision at near and sustained close work.
- TE’s distance and near phoria and vergence findings fluctuate significantly between tests days, suggesting visual instability.
- TE was evaluated by a neurotologist ruling out inner ear problems as a cause of her dizziness.
- CT & MRI scans are unremarkable
- Damage to the dorsal stream has been shown to cause symptoms such as difficulties adjusting to complex visual scenes, reading, visual guidance of movement and difficulties with ambulation.
- Patients with TBI also often experience dizziness in surroundings that have excessive visual stimulation i.e., grocery stores or shopping malls.
- Disequilibrium triggered by movement, multi-visual stimuli, and changes in gradation in the environment suggest a mismatch in the visual-vestibular system.

V. Treatment, management

- Full distance spectacle lens was prescribed with 15% blue tint for visual comfort.
- Thirty sessions of in-office neuro-optometric rehabilitation was also prescribed.
- Therapy was sequenced into three phases.
  - Phase 1: Visual input. Therapy included techniques that focus on accommodation, fixation, pursuit, saccades and convergence. Goal was to stabilize and equalize skills in each eye.
  - Phase 2: Visual processing. Therapy included techniques that focus on increasing range, speed, stability and fluidity of accommodative and vergence systems. Goal was to develop stable fusional vergence ability and accommodative flexibility.
  - Phase 3: Top-down processing. Vestibular and multisensory integrations were incorporated in majority of the therapy procedures. Loading techniques included yoked prism, balance board, metronome, and head posture sensor. Goal was to establish automaticity and enhance visual planning and visual spatial processing.
- Exit PTVS survey shows significant improvement or elimination of all symptoms.
VI. Conclusion

- Visual information processing plays an important role in feeling stable.
- Visual inputs communicate with vestibular and somatosensory systems to coordinate motor responses and maintain balance during head and eye movement.
- Mismatch in any one of these pathways often results in dizziness, disequilibrium and vertigo.
- In our case, treating the patient's convergence insufficiency and stabilizing her visual inputs eliminated her sense of imbalance.
- Neuro-optometric rehabilitative therapy enhances balance therapy by stabilizing binocular vision.
- Inter-professional management is important for effective rehabilitation of these patients to improve their quality of life.

VII. References