Concussion: Common Vestibular Abnormalities and Treatment Interventions

Allen Jarratt, P.T., D.P.T., M.T.C.

Overview

• Majority of individuals recover 7 to 10 days post injury\(^1\)
• However, despite initial rest up to 30% of individuals may have ongoing symptoms\(^1,2,3\)
• Which sports have the highest incidence of concussion?
How is concussion evaluated?

- In the past concussion evaluation has involved symptom reports, neurocognitive function and standing balance. 
- Evidence suggests that assessment of vision, exertion and cervical spine involvement post concussion can help guide appropriate treatment strategies and determine the potential source of symptoms.

What symptoms are most common

- Headache is the most common symptom reported following a sport-related concussion.
- Dizziness is the second most commonly reported symptom following a sport-related concussion.

Dizziness: Subjective

- Symptoms
  1. Vertigo – very specific, “the room is spinning”
  2. Dizziness – often a more general term to describe symptoms (fogginess, off balance, “I just don’t feel right”)

- When do the symptoms occur?
  1. Rolling over in bed, getting out of bed in the morning
  2. Looking from side to side in a grocery aisle or looking to change lanes while driving
  3. Trying to focus in class or when looking at a screen for prolonged periods of time

- How long do the symptoms last?
  1. Seconds, minutes, hours, days?
Benign Paroxysmal Positional Vertigo (BPPV)

- Study of dizziness following mild head trauma in military personnel
  - 28% had positional vertigo
- Subjective:
  1. Complaints of vertigo that lasts for <60 seconds with position changes
- Objective:
  1. Dix–Hallpike: reproduction of dizziness and nystagmus
  2. Roll test: test for horizontal canal
- Assessment:
  1. Dix–Hallpike: Posterior canal involvement would have upbeat and torsional nystagmus
  2. Roll test: Horizontal canal would show geotrophic (toward the earth) and <60 seconds nystagmus for canalithiasis or apogeotrophic (away from the earth) and sustained nystagmus for cupulolithiasis
- Plan: Treat with canalith repositioning (also called Epley maneuver) for posterior canal or barbecue roll for horizontal canal
  1. Follow-up in one week for re-assessment
  2. Discharge to home exercise program if symptoms resolving

BPPV Explained

- Otoconia - calcium carbonate crystals
- Otoconia dislodge:
  - Canalithiasis - float in the semicircular canals
    - Most common type
    - Symptoms last for <60 seconds
  - Cupulolithiasis - adhere to the cupula
    - Symptoms last for a longer duration

BPPV: Treatment

- Canalith Repositioning, also called Epley maneuver
- Brandt–Daroff exercises for home exercise program
- Prognosis - Approximately 90% symptom improvement
- High rate of recurrence
BPPV: Treatment

- For treatment of horizontal Canal BPPV
- “Barbecue” roll

Quest for common Terminology

- Post Concussive Syndrome – there is often a lack of consistency amongst clinicians to describe the impairments treated in rehabilitation post concussion

I. Vestibulo-ocular

II. Cervicogenic

Vestibulo-ocular Impairments

- Functional Impairments:
  1. Symptoms of dizziness with head movement
  2. Poor visual acuity with head movement
- Objective Findings:
  1. Positive head thrust
  2. Poor Convergence
  3. Greater than a two line difference with dynamic visual acuity testing
  4. Symptom provocation and difficulty or inability to perform part 4 of M-CTSIB
Treatment: Gaze Stability

- Respond well to exercises for improved gaze stability and improved balance

- Principles of Gaze Stability:
  1) Duration: 1-2 minutes
  2) Speed: VOR functions at speed of 2 Hz. Image must stay in focus and stable
  3) Background: Start with plain, progress to distracted
  4) Position: Seated – Standing - Walking
  5) Distance: Start near, progress to far
  6) Target Size: Vary the image of image
  7) Frequency: Begin 1-2 times per day, progress to 3-5 times per day

---

Treatment: Gaze Stability

- VOR x 1

- VOR x 2

---

Treatment: Balance

- Functional impairments:
  1) Off balance with head movements
  2) Complaints of balance loss with head movements

- Treatment Variables:
  1) Altering visual input
  2) Altering somatosensory
  3) Altering both
Cervicogenic Impairments

- Muscle trauma and inflammation due to traumatic mechanism of injury
- Impaired proprioception of the cervical spine

**Symptoms:**
1. Neck pain, stiffness and decreased range of motion
2. Headaches that are worsened by excessive head motion
3. Poor postural awareness

**Treatment:**
1. Respond well to manual therapy for improved upper cervical mechanics and cervical spine ROM
2. Need training of vestibular system for improved gaze stability and balance
3. Also benefit from training of deep cervical neck musculature for improved posture and improved proprioception

---

**References**