When a Concussion Causes More than Just a Headache

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Abstract: A review on diagnosing and treating a vertical heterophoria and accommodative paresis in a patient with post-concussive disorder.

I. Case History
   a. 17 yo white female
   b. Patient presented with the complaint of a headache without relief, blurry near vision, and horizontal diplopa that worsened as the day proceeded. The patient suffered a TBI caused by a knee to the back of the head on 4/26/15 during a soccer game. Two weeks later the patient experienced a seizure, causing her to fall and hit her head on the bathroom counter.
   c. Ocular history negative for eye related diseases or conditions. Medical history positive for concussion post TBI on 4/26/15.
   d. Patient taking 100 mg Topamax
   e. Patient under care for vestibular therapy and convergence training.

II. Pertinent findings
   a. Clinical
      i. Distance VA’s
         1. OD: 20/25+
         2. OS: 20/20
         3. OU: 20/20
      ii. Near VA’s
         1. OD: 20/30
         2. OS: 20/25
         3. OU: 20/30
      iii. Pupils: PERRL/2+/2+
      iv. EOMs: full, (+)pain, (-)diplopia
      v. NPC: 26 cm
      vi. NPA: 20 cm OD, 13 cm OS, 23 cm OU
      vii. MEM: +0.75D OD, +1.25D OS
      viii. Cover Test showed orthophoria with no vertical component at both distance and near
      ix. Maddox rod revealed 1 PD right hyperphoria
      x. Monocular lens rock: OD 4.5 cpm, OS: 7 cpm
      xi. Step vergence ranges are as follows
         1. Divergence Distance: x/16/15
         2. Convergence Distance: x/20/14
3. Divergence Near: x/30/25  
4. Convergence Near: x/20/14
   xii. Pursuits jerky with undershoots  
   xiii. Saccades slow, but WNL  
   xiv. Retinoscopy: -0.50D OD, plano-0.50x180 OS  
   xv. Refraction: plano OD, plano OS  

b. Physical  
   i. (+)head tilt to the right, which was not present prior to the injury  

c. Radiology Studies  
   i. CT scan  
   ii. MRI  

III. Differential Diagnosis  
   a. Vertical heterophoria  
   b. Paresis of accommodation  
   c. Convergence Insufficiency  
   d. Cranial nerve IV palsy  

IV. Diagnosis and Discussion  
   a. Diagnoses  
      i. Vertical heterophoria- right hyperphoria  
      ii. Accommodative paresis  
      iii. Post-concussive syndrome  
   b. Discussion  
      i. In a patient who suffers a TBI that results in a concussion, it is important to not only do an examination on the health of the eyes, but also perform a comprehensive exam on the binocular and accommodative systems also needs to be performed. A vertical misalignment can often be found in patients who suffer from a concussion, with several of these patients being symptomatic. By correcting this vertical misalignment, a drastic change can be noticed in patient symptoms making them more comfortable to complete everyday tasks-such as reading-without experiencing diplopia. Another important aspect to closely examine is the accommodative system, as this system can be greatly affected in a post-concussive patient. By enrolling patients in a vigorous therapy program, the accommodative system can be quickly built up to be within the normal range, allowing the patient to become free of symptoms-such as blur, eye strain, and headaches.  

V. Treatment, management  
   a. Vertical heterophoria  
      i. 1PD BU Fresnel prism over OS  
      ii. Patient reported a drastic difference in comfort and vision after adding Fresnel prism to glasses. With the addition of the prism, the patient was
able to sit upright and was free of diplopia. Research has shown that with the additional of prism, the burden of symptoms can be reduced by 71.8%.

b. Accommodative paresis

i. In-office Vision Therapy (all tasks done monocularly)- once per week for 1 hour sessions
   1. Accommodative push-ups
   2. Distance/Near Hart Chart
   3. Hopping cards with +/- flipper bars (started with +/-1.00 D, and increased in +/-0.50 D increments until +/-2.50 D is reached)
   4. Lens sorting (-4.00 D to +4.00 D in 1.00 D jumps, then 0.50 D jumps)

ii. At-home Therapy (all tasks done monocularly)- done 5 times per week for 15 min per session
   1. Accommodative push-ups
   2. Hopping cards with +/- flipper bars (same powers as in-office therapy)

iii. Patient reported that reading/near work had become significantly easier to perform, and was able to complete a summer reading project she had previously decided against due to severity of symptoms. A study completed by Master et al, states that accommodative disorders were among the most common (51%) in children age 11-17 who suffered a concussion.

c. Bibliography


VI. Conclusion:
It is imperative that practitioners check for vertical misalignment and fully assess the accommodative and vergence systems in post-concussive patients to ensure that proper treatment can be prescribed and provided. Correcting any vertical misalignment and completing an accommodative therapy program can have a enormous impact on resolving a patient’s symptoms as well as improving their overall quality of life.