

## Vision Therapy and Traumatic Brain Injury

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Vision difficulties after traumatic brain injury (TBI) are common and often difficult to recognize<sup>1,2</sup>. I have had an opportunity to formally review efforts concerning both the assessment of visual dysfunction<sup>3</sup> as well as therapies available for these concerns<sup>4</sup>. Although there are relatively few studies defining the best approach to rehabilitating patients suffering TBI<sup>5</sup>, current evidence supports a multidisciplinary program<sup>6</sup>. As with any large team endeavor, co-ordination of responsibilities is necessary for success<sup>7</sup>. Among the critical members of this team, there should be vision specialists dedicated to working with patients who demonstrate deficiencies in eye teaming, loss of visual acuity and/or visual field as well as uncoupling of “visuospatial awareness”. For the most part, the optometric and neuropsychological communities have embraced visual rehabilitation efforts; notably, these providers have documented successes in helping brain injury patients improve their quality of life<sup>8,9,10,11,12,13</sup>.

In my experience, vision rehabilitation efforts tend to be offered toward the end of the rehabilitative process of TBI patients. In part, this is because intense efforts are often required simply to ensure patient survival and recovery of basic living skills. In addition, vision rehabilitation is usually provided in the outpatient setting and patients often are not ready to travel for regularly scheduled visit until the latter parts of their rehabilitative program. Finally, it takes longer for patients and caregivers to become aware that there are issues related to visual system dysfunction because these deficits are subtle. When patients heal sufficiently to recognize that their vision may be problematic, or when caregivers note that their patients seem to plateau in their improvement, vision issues then seem to get addressed. The difficulty imposed by this paradigm stems from the fact that vision problems can impede the overall rehabilitative plan. Patients suffering reduced visual acuity, visual neglect of their surroundings

or fatigue from expending supernormal efforts to maintain fusion would undoubtedly participate less robustly in their own rehabilitative efforts. Inpatient and outpatient rehabilitation facilities provide a unique setting for TBI patients during which global assessments of their function can be provided. These global assessments should include evaluations of vision problems related to brain injury so as to permit early intervention; vision rehabilitation must be integrated within the overall rehabilitation plan. Notably, evidence-based data strongly support early intervention<sup>14</sup>. My personal experience with respected regional and national rehabilitation centers such as the Lancaster Rehabilitation Hospital (Lancaster, PA), the Comprehensive Sports Concussion Program at Sinai Hospital (Baltimore, MD) and the National Intrepid Center of Excellence (NICoE) confirm that this paradigm is successful.

#### **References:**

1. Dougherty AL, MacGregor AJ, Han PP, Heltemes KJ and Galarneau MR: Visual dysfunction following blast-related traumatic brain injury from the battlefield. *Brain Inj* 2011, 25:8-13.
2. Bodack MI: Pediatric acquired brain injury. *Ref. B. Optometry* 2010, 81:516-27.
3. Singman EL: Automating the assessment of visual dysfunction after traumatic brain injury. *Medical Instrumentation* 2013, accessed September 2013 at: <http://www.hoajonline.com/medicalinstrumentation/2052-6962/1/3>
4. Padula WV, Singman EL, Vicci V, Raquel Munitz and Magrun WM. Evaluating and treating visual dysfunction. Chapter 45, *Brain Injury Medicine: Principles and Practice*, 2<sup>nd</sup> Ed. 2012; Zasler N, Katz D, Zafonte R (editors).
5. Brasure M, Lamberty GJ, Sayer NA, Nelson NW, Macdonald R, Ouellette J, Wilt TJ. Participation after multidisciplinary rehabilitation for moderate to severe traumatic brain injury in adults: a systematic review. *Arch Phys Med Rehabil.* 2013 Jul;94(7):1398-420.
6. Turner-Stokes L, Disler PB, Nair A, Wade DT. Multi-disciplinary rehabilitation for acquired brain injury in adults of working age. *Cochrane Database Syst Rev.* 2005 Jul 20;(3):CD004170.
7. Singman EL. Vision after Brain Injury. Invited Lecture. Department of Veterans' Affairs Blind Rehabilitation Services National Convention. Crystal City, Va. August 2010.
8. Doble JE, Feinberg DL, Rosner MS, Rosner AJ. Identification of binocular vision dysfunction (vertical heterophoria) in traumatic brain injury patients and effects of individualized prismatic spectacle lenses in the treatment of postconcussive symptoms: a retrospective analysis. *PM R.* 2010 Apr;2(4):244-53.
9. Ajina S, Kennard C. Rehabilitation of damage to the visual brain. *Rev Neurol (Paris).* 2012 Oct;168(10):754-61
10. Ciuffreda KJ, Yadav NK, Ludlam DP. Effect of binasal occlusion (BNO) on the visual-evoked potential (VEP) in mild traumatic brain injury (mTBI). *Brain Inj.* 2013;27(1):41-7
11. Hayes A, Chen CS, Clarke G, Thompson A. Functional improvements following the use of the NVT Vision Rehabilitation program for patients with hemianopia following stroke. *NeuroRehabilitation.* 2012;31(1):19-30.
12. Barrett BT. A critical evaluation of the evidence supporting the practice of behavioural vision therapy. *Ophthalmic Physiol Opt.* 2009 Jan;29(1):4-25
13. Kerkhoff G, Keller I, Artinger F, Hildebrandt H, Marquardt C, Reinhart S, Ziegler W. Recovery from auditory and visual neglect after optokinetic stimulation with pursuit eye movements--transient modulation and enduring treatment effects. *Neuropsychologia.* 2012 May;50(6):1164-77.
14. León-Carrión J, Machuca-Murga F, Solís-Marcos I, León-Domínguez U, Domínguez-Morales Mdel R. The sooner patients begin neurorehabilitation, the better their functional outcome. *Brain Inj.* 2013; 27(10):1119-23.