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Introduction

Visual disturbances in acquired brain injury

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Welcome to the thematic issue of *NeuroRehabilitation* entitled "Visual disturbances in acquired brain injury." I am delighted to present this topic, which is dedicated to updating the neurorehabilitation community on recent advances in diagnosis and management of visual/vestibular disturbances in patients with acquired brain injury as well as discuss the vastly changing field of optometry and ophthalmology and co-management with our peers in physical and occupational therapy.

In this journal, we have teamed together neuro-optometric, neuro-ophthalmologic, and vestibular physical therapy authors to discuss the symptoms of visually derived dizziness, light sensitivity, headaches, and visual processing complaints in this population. This thematic issue will take a deep dive into the differential diagnosis of these symptoms in hopes to aid providers in making the appropriate and necessary referrals for adequate diagnosis and treatment. For example, some patients may incur an ocular health problem and need to see a medically or osteopoathically-trained eye surgeon (ophthalmologist) and/or an optometrically trained primary eye care provider (optometrist). Other patients may have permanently reduced vision or a symptom-provoking eye movement problem and need to be referred to an optometrist with specialty training in low vision and/or neuro-optometry for vision rehabilitative therapy. Further, some visual complaints like blur with head movement, eye pain and light sensitivity may have an underlying vestibular, cervical, neurologic or psychiatric component and would benefit from a referral to a non-eyecare provider like physical therapy, neurology, and/or psychiatry.

It is estimated that 50–70% of the brains neuronal circuitry is related to vision. Thus, it is not surprising that subjective visual complaints in acquired brain injury are common in up to 65–79% of patients (Brahm 2009, Goodrich 2007). If these statistics surprise you, it is because visual impairments in acquired brain injury are often overlooked (Bertholdt-Lindstedt 2017). The majority of people think of vision as defined by visual acuity or the ability to see small details as measured on a standard eye chart, often measured as 20/20 or 6/6 depending on the country of origin. However, reduced visual acuity is rare in traumatic brain injury 0–3.4% (Merezhinskaya 2019) and only 28.6% of patients with stroke (Rowe 2013). While patients with blurry vision, double vision, and light sensitivity are often referred to eye care providers like optometrists or ophthalmologists, patients with symptoms of eyestrain, fatigue, nausea, dizziness, headaches, inattention, and anxiety may be overlooked for having an undiagnosed vision problem (Laukkanen 2017).

Visual field defects like hemianopsia (loss of the right or left half of the visual field) and quadrinopsia (loss of a right or left quadrant of visual field) are estimated to affect 20–57% of people who have suffered a stroke (Pollock 2019) and 29.8–50.3% of patients who have suffered a moderate or severe traumatic brain injury (Merezhinskaya 2019). Patients with visual field loss can often still have perfect visual acuity and pass a visual screening on an eye chart.

In addition to loss of visual field, patients can also have eye movement abnormalities causing physical symptoms of dizziness, nausea, and headaches and higher order visual processing difficulties causing them inability to spatially navigate in their environment or concentrate in visually crowded areas like school classrooms or grocery stores. Visual disorders can directly affect cognitive performance and/or exacerbate cognitive deficits (Rowe 2013).

Eye movement disorders also known as oculomotor abnormalities have emerged as a hot topic in the literature over the last decade as they are an objective biomarker for neurological dysfunction, can be utilized for concussion screening in acute and chronic settings (Mucha 2014), and are a major sensory system that can be actively rehabilitated with vision therapy and/or vestibular physical therapy for expedited recovery of brain injury symptoms (Collins 2016, Gallaway 2017). To make an accurate and asymptomatic eye movement, the ocular, vestibular, and cervical systems all need to be working in synchrony, making a symptomatic oculomotor system a multi-disciplinary complaint. This thematic issue has the privilege of presenting a review of the literature on the relevance of vestibular-oculomotor screening for saccadic (fast tracking eye movements), smooth pursuits (slow tracking eye movements), convergence (ability to cross the eyes), vestibular-ocular reflex (head-eye coordination with head and body movement), accommodative (eye focusing) and pupillary disorders in brain injury.

This thematic issue includes three articles that look into the differential diagnosis of post-traumatic eye pain, head pain, and photophobia (light sensitivity) and the appropriate treatment of such conditions in neuro-ophthalmology and neuro-optometry. Recent studies have found that the use of tinted lenses to abate photophobia symptoms in patients with TBI can exacerbate and prolong symptoms. This controversial treatment will be evaluated with arguments both for and against the application of colored and gray-tinted filters in patients with brain injury. We end this thematic issue with a look at visual processing disorders – which can be found in patients due to neurodevelopmental delay as well as acquired brain injury. Topics reviewed will include hemi-neglect and visual agnosias like topoagnosia, simultangonosia, and object agnosia to name a few.

It has been an absolute privilege to be the editor of such a special topic that impacts patients recovery and daily lives. The visual system is complicated and the authors have done an exceptional job at eloquently explaining intricate neuro-pathophysiology while keeping the content clinically relevant. I hope that you find this journal helpful in managing neurorehabilitative patients with visual complaints and opens your eyes to the intricacies of the multi-faceted visual system.

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