



Hyperbaric Oxygen Therapy in the treatment of concussion and post concussive syndrome
By Nancy O'Hara, MD and Gail Szakacs, MD. *In press* (2012).

Concussion or Mild Traumatic Brain Injury (mTBI) is a major public health issue affecting an estimated two to four million people annually in The United States due to sport and recreation-related activities. Up to 90% of concussions go undiagnosed or untreated, adding to the gravity of this public health crisis. Since younger athletes take longer to recover due to ongoing brain development, concussions in children and adolescents are of particular concern (with the highest rates of mTBI in children occurring in football, ice hockey, and girls soccer). But given the potential for cumulative damage and progressive neurodegenerative disease associated with mTBI, military personnel and college and professional athletes represent other populations at significant risk.

Concussions are not structural injuries, but the associated trauma triggers significant brain dysfunction in the setting of a 'normal' brain. Headache, nausea, visual disturbances and balance abnormalities are among the common symptoms of mTBI that often subside within seven days of injury. Up to 90% of people do not experience loss of consciousness and although headaches are the most common symptoms, they do not usually occur without other symptoms, and may not correlate with severity of injury.

The often fatal condition of Second Impact Syndrome (SIS) can occur if a person sustains a second concussion prior to complete symptom resolution and healing from an earlier concussion. Younger people are particularly vulnerable to SIS due to their ongoing brain development and slower recovery rate.

Another concern with mTBI is the potential for prolonged, severe, and cumulative effects that can evolve into Post Concussive Syndrome (PCS) and last for many months after injury. PCS does not appear to be associated with the severity of initial injury and can present as intractable headaches, memory impairment, cognitive abnormalities, worsening anxiety and/or irritability, depression, and insomnia. Regardless of how mild the initial injury was, PCS can result in severe debilitation and interfere with regular school, job or military activities.

An external injury to the brain promotes an immunoexcitotoxic reaction in brain cells, in which glutamate receptors are over-stimulated and trigger gradual destruction and neuronal loss. This process is associated with swelling and decreased cerebral blood flow and oxygen supply to the brain. Over time, calcium and other cofactors in the brain accumulate and cause toxicity, cell death (apoptosis), and eventually cognitive impairment, poor memory, sleep disturbances, depression, anxiety, and other debilitating clinical symptoms.

The only acknowledged treatment for mTBI is cognitive and physical rest, and most

Center for Integrative Health, LLC
Nancy H. O'Hara, MD & Gail M. Szakacs, MD
3 Hollyhock Lane Wilton, CT 06897
Tel: 203-834-2813 Fax: 203-834-2831



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treatment protocols for PCS merely focus on symptomatic treatment of headaches, depression, anxiety, insomnia, and other associated problems. This symptomatic treatment, however, ignores the underlying and progressive nature of the disease process and often has side effects that exacerbate symptoms and worsen overall long-term prognosis.

Case reports and emerging research studies propose a role for Hyperbaric Oxygen Therapy (HBOT) in promoting relief from PCS symptoms, faster brain healing, and better overall prognosis. Since HBOT can reduce inflammation and the immunoexcitotoxic reaction described above, HBOT may significantly benefit people with PCS.

The Center for Integrative Health in Wilton, CT is a consultative practice which integrates the care of patients with Autism Spectrum Disorder (ASD), other Neurodevelopmental Disorders, various chronic medical illnesses (including allergies, Lyme Disease, PANDAS, other autoimmune disorders, gastrointestinal problems, metabolic disorders, and malnutrition), and other problems such as Post Concussive Syndrome (PCS). Their comprehensive center offers a variety of functional medicine interventions, including Hyperbaric Oxygen Therapy (HBOT) for use in a primary or adjunctive role in the treatment of PCS and other acute injury or chronic illness.

Drs O'Hara and Szakacs are currently researching a protocol using HBOT as a key component with PCS treatment.

Workshops on preventing, recognizing, and treating concussions and PCS are planned over the next several months – clinicians, coaches, parents, and athletes of all ages are encouraged to attend.

To contact The Center for Integrative Health, please visit our website (www.ihealthnow.org) or call 203.834.2813.