

HBOT for symptoms of traumatic brain injury (TBI) and post-concussive syndrome

HBOT stimulates neuroplasticity, angiogenesis, cerebral metabolism, and stem cell regeneration and mobilization.



How Hyperbarics Helps



Increases cerebral blood flow



Decreases cerebral edema



Maintains the blood-brain barrier



Increases tissue oxygenation



Suppresses inflammation



Decreases apoptosis



Inhibits neuronal death



Improves cognitive function



Improved quality of life



Activates angiogenesis



Reactivates quiescent neurons



Forms new axonal connections



Creates synapses



Stimulates stem cell production and mobilization



What Research Says

Recently, numerous studies have shown with brain imaging that hyperbaric oxygen therapy (HBOT) decreases the symptoms of traumatic brain injury (TBI) and post-concussive syndrome. These studies have helped us gain a deeper understanding of the physiological effects of HBOT on the brain. Specifically, they have demonstrated that HBOT stimulates neuroplasticity, angiogenesis, cerebral metabolism, and stem cell regeneration and mobilization. Using computerized cognitive evaluations, they demonstrated that HBOT also measurably improved cognition, mood, quality of life, memory, executive function, attention, visual as well as spatial and motor skills. They drove improvements across cognitive, psycho-social and quality of life indices.

Here are **three studies** that highlight the impact of HBOT treatment on TBI and post-concussive syndrome:

Boussi-Gross Study [1]. Conducted in 2013, this study evaluated 56 patients using SPECT brain imaging. Researchers also evaluated patients on several other indexes: The Information Processing Speed Index, Attention-related index, Memory-related index, and Executive function Index. In short, these patients showed significant improvements in cognitive function and quality of life (QOL). Results from SPECT imaging correlated these cognitive improvements in planning, organization, initiation and behavior regulation with improved brain activity. Data showed that HBOT induced neuroplasticity in the brain of patients with impaired brain functions and impaired QOL, leading to repair of the brain and improved QOL.

Hadanny Study [2]. In 2018, Hadanny et al., measured neurocognitive damage in 154 patients suffering from TBI. The study measured neurocognitive damage in these patients, both pre- and post-HBOT, using computerized cognitive evaluations and brain SPECT imaging. These evaluations showed that HBOT induced

improvements in all measured areas of cognitive function. The largest measurable improvements were shown for memory, attention and executive function, followed by visual, spatial and motor skills. They found a strong correlation between these improvements and increased brain activity as shown through brain imaging.

Harch Study [3]. In 2017, Dr. Harch et al., studied 29 United States military veterans with mild TBI, post-concussive syndrome and post-traumatic stress disorder. Prior to the study, subjects reported problems with thinking, low energy, headaches, depression, mood volatility, short term memory loss and disrupted sleep. The veterans in the study experienced significant improvement in depression, anxiety, post-concussive symptoms, physical and emotional functioning and self assessed cognition. Of twelve patients who expressed suicidal ideation before treatment, ten no longer expressed suicidal thoughts after their HBOT treatments.

The Defense and Veterans Affairs departments pointed out as of August 2019, 20 veterans commit suicide each day. Any tool shown in a study to reduce suicidal ideation by over 80% would seem worth trying. Abnormal blood flow observed in the white matter of veterans' brains changed significantly as a result of HBOT. Researchers defined the white matter as a region of interest (ROI) in 8 veterans' brains. These veterans showed improvements in this ROI by 75%. They improved so much that blood flow in these areas became statistically indistinguishable from that of the Control group (patients who entered the study without restricted blood flow). Six months after treatment, most veterans continued to demonstrate improvement in their symptoms. Out of 18 subjects, there was further improvement in 14, deterioration in 3 and no change in 1, for an overall improvement of 78%.

Overall, studies show that HBOT Improves both outcomes and survival.

At Bay Area Hyperbarics, we have treated physician-referred patients with TBI and post concussive syndrome (PCS) for over 20 years. We have most commonly treated patients who have experienced memory loss, headaches, sensitivity to light and sound, dizziness, sleep disturbances, inability to perform routine tasks and mood volatility. Some patients also presented other QOL, cognitive, physical and emotional symptoms. Most of our treated patients with TBI and/or PCS experienced significant improvements, such as the

ability to return to work and school, or to return home to care for family members. Most all of our patients have returned to a much higher level of functioning after their treatment regimens with HBOT.

Although multiple studies that are both valid and reliable document improvements for patients who have received HBOT, some still dismiss HBOT as a viable treatment. However, physicians who have referred their patients to Bay Area Hyperbarics have seen significant improvement and have been very happy with their physician-referred treatment regimen.

Research Studies

[Plos One](#)

Hyperbaric Oxygen Therapy Can Improve Post Concussion Syndrome

The study involved 56 mTBI patients with prolonged PCS. It was a prospective, randomized, crossover controlled trial where patients were randomly assigned to treated or crossover groups. The treated group received 40 HBOT sessions, while the crossover group had a control period of no treatment before receiving the same number of HBOT sessions. Both groups showed significant improvements in cognitive function and QOL, along with elevated brain activity observed through SPECT imaging.

[BMJ Open](#)

HBOT can treat chronic neurological deficits due to traumatic brain injury (TBI) of all severities

The average age was 42.7 ± 14.6 years, and 58.4% were men. All patients had documented TBI 0.3–33 years (mean 4.6 ± 5.8 , median 2.75 years) prior to HBOT. HBOT was associated with significant improvement in all of the cognitive domains, with a mean change in global cognitive scores of 4.6 ± 8.5 ($p < 0.00001$). The most prominent improvements were in memory index and attention, with mean changes of 8.1 ± 16.9 ($p < 0.00001$) and 6.8 ± 16.5 ($p < 0.0001$), respectively. The most striking changes observed in brain single photon emission computed tomography images were in the anterior cingulate and the postcentral cortex, in the prefrontal areas and in the temporal areas.

Case control study: Hyperbaric oxygen treatment of mild traumatic brain injury persistent post-concussion syndrome and post-traumatic stress disorder

HBOT was tested on 30 US military subjects with mild TBI persistent post-concussion syndrome (PPCS) and post-traumatic stress disorder (PTSD) that occurred after 9/11/2001. The results of the study showed significant improvements in neurological exam, symptoms, quality of life, and psychological measures. SPECT imaging also revealed significant improvement after 1 and 40 HBOT sessions, and the effects were sustained at a 6-month follow-up. The study found that HBOT was safe and effective for treating veterans with mild to moderate TBI PPCS with PTSD.

Patient Experiences

Listen to what real patients have to say about their experiences.



”

Elliot was in high school when he had his second concussion caused during football when he collided with another player's head and helmet.

He didn't recover from this concussion as he had with the first one. After two months, he stopped going to school. Maintaining a regular schedule just became too difficult given his inability to concentrate, his memory loss and even reading became too difficult due to his blurry vision. He came to Bay Area Hyperbarics five months after his concussion with the above issues and depression, intermittent fatigue, sleep disturbances, and headaches. His parents tried several different therapies, diet changes, supplements and migraine medications. He was supervised by a psychiatrist and on prescription anti-anxiety meds and took medication for depression. He was also receiving acupuncture. It took two months of hyperbaric therapy to heal his brain well enough to return to school. He seemed like a different person when he left our clinic. He was smiling and walked with a healthy gait. However, he did not return to play football as recommended by his neurologist. She had a double mastectomy, radiation and chemotherapy. The weakness and fatigue that followed in the wake of her procedures were bad enough, but the pain that arose was almost debilitating. Because of the pain, she had difficulty driving her girls to daycare because she could barely hold onto the steering wheel. She complained that her arms felt like lead and her left shoulder hurt with a shocking intensity every time she turned the steering wheel. She simply cried in pain as she drove. Her physician diagnosed this pain as damage from the radiation treatments, and he sent her to Bay Area Hyperbarics. Karen's hyperbaric oxygen treatments healed her pain, the swelling and the aching. To her additional relief, HBOT also helped diminish the overall body fatigue that otherwise increased as morning progressed to afternoon.

Elliot, 17

After a second concussion, Elliot could not remain in school. HBOT healed him.



Jeremy is a high functioning big data management engineer in Silicon Valley. He loved surfing, mountain biking, and taking his dog with him.

Jeremy had a history of head injuries from sports, including years of soccer headers, football injuries and mountain biking accidents. Jeremy had come in to Bay Area Hyperbarics during high school when he found he had difficulty keeping up in his AP math classes. He was thinking of dropping out of AP math but his mother brought him in to us for HBOT. HBOT was able to help him enough that he stayed in AP math and graduated with honors. Jeremy graduated high school and went on to a prestigious university to become an engineer and linguist. Eleven years after we first saw him,

Jeremy brought himself into our clinic for a second time. He was having problems keeping up with the high demands of his job. He said he had to maintain concentration on many variables at the same time while solving complex problems. He feared he was having some days where he just could not perform up to his expectations. He said he needed more focus, better memory and more energy as he also had bouts of fatigue. He was treated using the Haddany study protocol (see the study cited above). Jeremy came back to visit us after finishing his HBOT treatments. He told us he was extremely pleased with his ability to perform now with greater ease, much more quickly, and he finds that answers come to him quicker. He says his energy has improved, not only at work, but also with his mountain biking.

On some school holidays, she brings one of her children in to the shop. Angelina had a lumpectomy and radiation to her right breast. The difficulty started slowly over the next several years when she had pain on lifting up her right arm. Cancer was ruled out. She was sent to physical therapy. She did her physical therapy exercises daily as they requested but the weakness and pain continued to make working difficult as she repaired items on the machines. I gave her information about hyperbaric medicine and what it had done for my mother. She took it to her physician who approved her for HBOT.

The mild swelling and some pain reduced within the first week of treatments. It took 30 treatments to repair the tissues to dispel the pain. A year later she was still working in the shop without pain or range of motion issues.

Jeremy, 27

HBOT improved his ability to multitask after multiple traumatic brain injuries.



”

Marian had taught acupuncture for 12 years to students in a prestigious acupuncture school. She loved teaching and was devoted to her students. One day a reckless driver drove into Marian's car so fast it resulted in multiple injuries including a head injury. She recovered from her other injuries but her head "just wasn't right". She came to Bay Area Hyperbarics after 6 months of biofeedback, acupuncture and other therapies. She was depressed and was thinking of early retirement because she said she couldn't teach students with her sluggish brain. She complained about piles of paper stacked around her house that she couldn't sort through. She was plagued with intense emotional swings. She also was so anxious that she would sit in our waiting room and cry while working at "pulling herself together to drive home". She had become anxious of driving. Hyperbaric oxygen therapy repaired her brain and resolved her emotional volatility, anxiety, depression, and "sluggish brain". She said she could think normally again. She returned to full time work teaching her students again.

Marian, 62

Hyperbaric therapy returned Marian to teaching acupuncture.

Refer a Patient

Refer a patient in three easy steps.

1 You submit patient's information

As a provider, your office fills out and faxes back the Patient Referral Form. Have questions? Call us!

2 We get authorizations

We make sure the patient understands treatment and then follow the prescribed protocol to get the patient on the road to recovery!

3 Patient starts HBOT

Our medical staff meets with the patient to ensure that HBOT is appropriate, and contacts Medicare or private insurance to receive authorization.



 **Call Us: (408) 356-7438**

Scan for Patient Referral Form