Brain Injury and PTSD Treatment Hub

Hyperbaric Oxygen Therapy (HBOT)

Cooper Hodges, PhD

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In this section

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What is hyperbaric oxygen therapy?

Hyperbaric Oxygen Therapy (HBOT) is a treatment involving breathing pure oxygen in a pressurized environment. Air pressure in the special chamber is typically 1.5 to 2.5 times higher than average.

> *Hyperbaric oxygen therapy is essentially breathing oxygen at greater than normal atmospheric pressures. ... One of the things that does in the brain is help create new capillaries so it starts building capillaries around the injured area. So we're getting new blood flow to that injured area of the brain.*
>
> — Eddie Gomez, President, Rocky Mountain Hyperbaric Association for Brain Injuries

What can hyperbaric oxygen therapy help with?

Brain injury, PTSD, decompression illness, carbon monoxide poisoning, osteomyelitis, radiation necrosis, gangrene, and other wound healing (i.e., open bone fractures, burns, and other soft tissue injuries like ulcers, open, or deep tissue wounds)

What is hyperbaric oxygen therapy like?

Hyperbaric Oxygen Therapy involves breathing 100% pure medical-grade oxygen in a special pressurized chamber. The chamber can be for a single person or large enough to accommodate multiple people. Pure oxygen is delivered via a mask or a hood, all while you are being monitored by HBOT technicians. Multiple, consecutive, daily sessions are typically required, often over a period of many weeks. The exact protocol (including amount of pressure used, frequency and length of sessions, as well as duration of overall treatment) will vary depending on the nature of the injury or condition being treated.

Why does it work?

The idea behind HBOT is that by breathing pure oxygen in a pressured environment, your blood is able to promote healing and repair damaged cells faster than normal. It is also thought to have a neuroprotective effect such that the area of tissue surrounding a brain injury that is "at risk" or vulnerable to dying/becoming damaged is minimized. This can contribute to recovery of neurological function. HBOT is thought to help reduce headaches, and lead to improved sleep, mood, and cognitive functioning.

How strong is the evidence?

HBOT is a well-established treatment for a variety of conditions (including decompression illness, open bone fractures, burn injuries, radiation necrosis, and diabetic ulcers, among others) but its use for treating TBI and PTSD is controversial.

The evidence on the effectiveness of HBOT for TBI and PTSD is inconsistent and inconclusive. Overall, HBOT may hold some promise as a potential helpful treatment when provided during the acute stage (within 1 week to 1 month post injury). However, at this time there is not sufficient evidence to recommend its use as standard practice. To date, there are no well-designed studies investigating the benefits of HBOT in the subacute or chronic stages of recovery. More well-designed large-scale studies are needed in order to determine its effectiveness, as well as to answer important questions like exactly what it helps with (i.e., survival vs. neuroprotection vs. functional and cognitive outcomes), and to establish standardized procedures for how to administer it (i.e., at what pressure setting, how often, for how long).

A 2015 Government Accountability Office study (/research/research-hyperbaric-oxygen-therapy-treat-tbi-and-ptsd) examined 32 peer-reviewed, published articles about the use of HBOT to treat traumatic brain injury and PTSD, 29 of which focused solely on TBI. Three of those articles focused on the safety of HBOT in treating TBI and concluded that HBOT is safe. But in assessing the effectiveness of HBOT--does it actually work?--GAO's study reported mixed results. GAO's review included 12 articles reporting on intervention studies or clinical trials seeking to measure the effectiveness of HBOT therapy in treating TBI. Four of those articles (two on severe TBI and two that did not specify severity) reported that HBOT therapy was effective. The other eight articles focused on mild TBI. Six of those eight concluded that HBOT was not effective and two concluded that it was.

A follow-up report in 2018 (https://www.ncbi.nlm.nih.gov/books/NBK499535/), conducted by the Department of Veterans Affairs' Evidence-based Synthesis Program, examined the use of HBOT to treat TBI or PTSD. This report re-analyzed 16 randomized controlled studies that had been included in either the 2015 GAO report, the 2017 Journal of Head Trauma Rehabilitation report, or both. The 2019 VA report found "inconclusive evidence of HBOT's benefits at least for mild TBI and PTSD" and found that "current evidence does not clearly support any one argument over another for or against HBOT (*Evidence Brief: Hyperbaric Oxygen Therapy (HBOT) for Traumatic Brain Injury and/or Post-Traumatic Stress Disorder*, 2018)."

The report concluded: "Broad usage of HBOT as an initial treatment for mild or moderate to severe TBI and/or PTSD in lieu of conventional treatments still does not appear warranted. When patients do not respond to and/or do not tolerate adequate trials of multiple conventional therapy options and are considering emerging treatment options, offering HBOT to veterans with mild or moderate to severe TBI and/or PTSD is reasonable. Prior to HBOT use, clinicians and patients should consider its potential increased risk of barotrauma and/or pulmonary complications."

Although this review found no significant benefit, a recent study published in 2020 (https://www.medgasres.com/article.asp?issn=2045-9912;year=2020;volume=10;issue=1;spage=8;epage=20;aulast=Harch) on HBOT in civilian and military subjects with mTBI/PPCS (persistent postconcussion syndrome) did show significant improvements in postconcussion and Post-Traumatic Stress Disorder symptoms, memory, cognitive functions, depression, anxiety, sleep, and quality of life as compared to control group patients. Improvements lasted for at least 2 months after the 40th HBOT session.

HBOT is generally regarded as a safe procedure, but like many medical procedures, the treatment carries some potential risks. They include:

- Middle ear injuries, including leaking fluid and eardrum rupture, due to changes in air pressure
- Temporary nearsightedness (myopia) caused by temporary eye lens changes
- Lung collapse caused by air pressure changes (barotrauma)
- Seizures as a result of too much oxygen (oxygen toxicity) in your central nervous system
- Lowered blood sugar in people who have diabetes treated with insulin
- In certain circumstances, fire — due to the oxygen-rich environment of the treatment chamber (*Hyperbaric Oxygen Therapy - Mayo Clinic*, 2020)

Although there has been a lot of research done on HBOT over the past 40-50 years, and although it is a well validated treatment for many other conditions, there remains a great deal of inconsistency and uncertainty regarding the potential effectiveness of HBOT for the treatment of TBI (across the range of severity) and for PTSD.

In addition, HBOT can be expensive and often is not covered by most health insurance. Please consult with a medical professional, consider getting a second opinion, and carefully consider the pros and cons before seeking this treatment.

What do patients say?

HBOT has been offered to many people with TBI or PTSD, and it's not hard to find patients who say that HBOT has helped them, sometimes dramatically. Here are some examples from three people who have been through HBOT (Please note that we haven't sought out comments from people who didn't benefit from HBOT, and that individual stories like these are not the same as systematic studies):

I went there for over a month along with one other friend to help deal with the issues I suffered with related to TBI/PTS. I received a total of 40 treatments. After the first few treatments, my migraines went away completely and have not returned except for rare circumstances. HBOT has definitely helped reduce the physical pain as well as the symptoms I suffered with specific TBI/PTS.

— Nick Santoro (https://www.o2oasis.com/internationally-treated-conditions/traumatic-brain-injury-tbi/), Veteran, U.S. Marines Corps

The first thing I noticed right away, my eye used to droop. They say it's one of the ways you can tell someone's had a TBI. As you can see, it's not anymore, and that was immediate. My wife said, as soon as I came out, she saw that, 'Hey your eye's fixed!' Massive headaches, daily for the last several years, and my pain level's gone from a 10 to a 2. The tinnitus, ringing in my ear, has gone from a 10 to a 2. My life is manageable now.

— Warren "Skip" Radcliffe (https://www.youtube.com/watch?v=ESeP8_eJyJ8), Veteran, U.S. Army>

I could see clear after the first treatment. I could. In the military we breathe pure oxygen rigs underwater so I was familiar with the effects and the euphoric feeling that oxygen could give you but that was what I noticed after the first treatment. It was a one-hour treatment. After four, I noticed it was actually, for sure, doing something to me. I improved steadily every day.

— Dave Rogers (https://www.youtube.com/watch?v=kZ3TFGjbptA&feature=emb_logo), Veteran, U.S. Navy SEAL

Video

What is Hyperbaric Oxygen Therapy HBOT (https://www.youtube.com/watch?v=78PXByMI5J8)
From YouTube

Jesse Prince, Veteran, United States Army, shares his experience with PTSD and HBOT (https://www.youtube.com/watch?v=t_xHBwckoyM)

What should I look for in hyperbaric oxygen therapy?

A qualified Hyperbaric Oxygen Therapy (HBOT) technician or center, up-to-date equipment, with knowledge of using HBOT to treat brain injury or PTSD.

Where can I find more information?

TreatNOW (https://treatnow.org/treatments/overview-hyperbaric-oxygen-therapy-hbot/) - An overview of Hyperbaric Oxygen Therapy

HBOT for brain injury (https://tbitherapy.com/hbot-for-brain-injury/)
From TBI Therapy

Hyperbaric Health and Wellness Foundation (https://hyperbarichealthandwellnessfoundation.org/)

Hyperbaric Oxygen Therapy (https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/hyperbaric-oxygen-therapy)
Johns Hopkins Medicine.

Hyperbaric oxygen therapy (https://www.mayoclinic.org/tests-procedures/hyperbaric-oxygen-therapy/about/pac-20394380)
Mayo Clinic

Where can I go to get hyperbaric oxygen therapy? (limited list)

There are many treatment and medical centers offering HBOT. HBOT treatment for TBI or PTSD is frequently not covered by medical insurance. Ask your doctors if they have any recommendations.

TreatNOW - Treatment Centers (https://treatnow.org/treatments/treatment-centers/) (HBOT locations for Veterans)

Mission 22 Veterans Rehab Project (https://mission22.networkforgood.com/projects/24108-veterans-rehab-project)

Hyperbaric Health and Wellness Foundation (https://hyperbarichealthandwellnessfoundation.org/)

Hyperbaric Health and Wellness Foundation - Veterans Program (https://hyperbarichealthandwellnessfoundation.org/veterans-program/)

Research, Articles, and Books

HBOT: A Way to Heal the Injured Brain? (/article/hbot-way-heal-injured-brain)
From BrainLine

Could Hyperbaric Treatment Heal the Brain? (https://www.washingtonpost.com/national/health-science/could-hyperbaric-treatment-heal-the-brain/2018/01/26/90b3acfa-df87-11e7-8679-a9728984779c_story.html)
From The Washington Post

Veteran suicide is a problem. Hyperbaric oxygen therapy is a solution. (https://www.militarytimes.com/opinion/commentary/2020/09/19/veteran-suicide-is-a-problem-hyperbaric-oxygen-therapy-is-a-solution/)
From Military Times

Hyperbaric treatments offer new promise Veterans chronic PTSD (https://blogs.va.gov/VAntage/43875/hyperbaric-treatments-offer-new-promise-veterans-chronic-ptsd/)
From VA Vantage blog

Role of hyperbaric oxygen therapy in severe head injury in children (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3401652/)
From Journal of Pediatric Neurosciences

Evidence Brief: Hyperbaric Oxygen Therapy (HBOT) for Traumatic Brain Injury and/or Post-traumatic Stress Disorder (https://www.ncbi.nlm.nih.gov/books/NBK499535/#:~:text=In%20case%20series%20of%20TBI,functioning%20and%20quality%20of%20life)
From VA Evidence Synthesis Program Evidence Briefs

DEFENSE HEALTH CARE Research on Hyperbaric Oxygen Therapy to Treat Traumatic Brain Injury and Post-Traumatic Stress Disorder (https://www.gao.gov/assets/680/674334.pdf)
From The U.S. Government Accountability Office, PDF

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Reviewed by Amy Shapiro-Rosenbaum, PhD, Lyndsay Tkach, MA, CBIS, and Michelle Neary, March 2021.

The BrainLine Treatment Hub was created in consultation with TBI and PTSD experts (/treatment/treatment-hub-expert-consultants).