PTSD - The Powerfully Therapeutic Role of Hyperbaric Oxygen Transcript

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Introduction to PTSD and Hyperbaric Oxygen

So hyperbaric oxygen has been around for hundreds of years, and it's traditionally for most people known to treat wounds. So if you look at PTSD, historically, we thought of it as a psychological disease.

But in fact, it is a brain physiology disease, there are changes to the brain. And when a veteran, for example, comes from a war, you might see their wounds on their legs, but they also have wounds in their brain from PTSD.

If we apply that concept of treating a wound to treating wounds of the brains for PTSD that makes this a logical treatment choice. Post-traumatic stress disorder can be at times a profoundly debilitating condition.

Hello, I'm Dr. David Perlmutter. Welcome again to the Empowering Neurologist. We're going to be talking about PTSD today and we're gonna be talk about it in the context of a novel and really interesting therapy that's just been developed and that is the use of hyperbaric oxygen therapy.

I will describe what that it is in treatment of this disorder. This is a common disorder. It's been estimated that about 6% of U. S. population will experience PTSD at some time in their lives.

And at any given time, about 5% percent of the U S population is actually living with PTSD. We know that, of course, as expected, this is is higher issue in terms of its incidence in veterans with 11 to 20% veterans who served in Operation Iraqi Freedom and enduring freedom, experienced this issue.

And for Vietnam veterans, the statistics may be as high as 30%. So, you don't have to be involved in combat to have experienced a trauma in your life to produce a PTSD.

We know that, for example, being exposed to climate change events or other traumatic injury can induce PTSD, women are about twice as likely as men to become sufferers from PTSD.

And we know that lifetime prevalence in women is around 10% and about 4% in men. The onset of PTSD typically begins around three months after the traumatic event.

But let's be clear, the actual diagnosis and full manifestation of PTSD may take years to fully manifest. It's known that this situation PTSD can, as I mentioned earlier, can be debilitating and it can last for years if not decades if it is left untreated.

We know there is substantial comorbidity associated with PTSD. are at greater risk for things like depression, anxiety disorders, substance abuse, and even cognitive decline and full on dementia.

So we really have to do our best to explore novel treatments, pharmaceutical treatments that's for sure, interventional types of treatments like cognitive behavioral therapy.

And what we're going to present today is another novel idea and that is the use of hyperbaric oxygen therapy as a treatment and we're going to look at some of the research that justifies recommending hyperbarics to treat PTSD.

Our guest is Dr. Mohammed Alamir. Let me tell you a little bit more about him. Dr. Mohammed Alamir or Dr Mo to his patients has been a part of the Aviv clinic team in the villages and here in Florida since the clinic opened in 2020.

PTSD Prevalence and Clinical Impact

As lead physician, he oversees the medical treatment for all clients at the aviv medical program, collaborating with

the other extensive staff of individuals creating these clinical programs to provide truly comprehensive care.

Dr. Elamair became involved in the Aviv clinics after his late father suffered a stroke and that sparked his interest in this novel approach to healing the brain.

He is the father of two children, including a son with autism spectrum disorder. and Dr. Lamire considers it his life mission to help progress his son's development and better understand the causes and treatment of ASD.

Today, of course, as mentioned, we are going to be exploring post-traumatic stress disorder and the use of this novel therapy. Let's get right to our interview.

Dr. Elamir, good to see you and how cool it is that you're actually doing this broadcast from inside the hyperbaric chamber. What's going on behind you?

What is this chamber all about? Yes. Thank you for having me, Dr Perlmutter. Yes, I'm inside one of our four hyperbolic oxygen suites. This is where we administer our hyper baric protocol.

I myself was in this Chamber two years ago, two hours a day, five days a week for 12 weeks. And this is how we treat our clients here at the IV clinic.

Interesting, along with, you know, multimodal approaches, physical therapy, occupational therapy cognitive training, a whole integrative approach to really helping people regain cognitive function and other aspects of brain health.

I want to just dive deep into the PTSD study and why hyperbarics was so effective. But before we do that, let's back it up a little bit and ask, why would anyone even consider that in PTSD hyperbaric oxygen therapy might be effective.

So mechanistically, why was it chosen and why wasn't the study done? Great question. Hyperbarric oxygen has been around for hundreds of years and it's traditionally for most people known to treat wounds.

If somebody has a diabetic foot ulcer, for example, that's not healing properly, hyperbolic oxygen is known help heal that wound. so if you look at PTSD, historically we thought of it as a psychological disease.

But in fact, it is a brain physiology disease. There are changes to the brain. And when a veteran, for example, comes from a war, you might see the wounds on their legs, but they also have wounds in their brain from PTSD.

So if we apply that concept of treating a wound to treating wounds of the brains for PTSD, that makes this a logical treatment choice. So then what is actually the hyperbaric oxygen doing in the brain of that PTSD patient?

Yes. You know, hyperbolic oxygen is applied in many different ways. So you could be in a multi-place chamber like this, or you can be on a mono-chamber.

There are very different characteristics between chambers and also different protocols that can achieve different things. Our specific protocol uses a multiplace chamber to fluctuate oxygen levels in specific way.

By sitting in here, we can give you an oxygen mask and take it on and off. And this is a protocol that Dr. Fradi, Dr Hadani, and my colleagues in Israel have developed over the last 15 years.

The point of the protocol is to trigger the body to have neurogenesis, stem cell proliferation, angiogenesis. So growing new cells, growing connections in the brain, new blood vessels, in addition to healing injury.

So when we see the wound in the brain related to PTSD, this mechanism of cell growth, both the blood vessels, mitochondrial biogenesis is applied to that wound and the brane.

And when you heal that, you can heal and help somebody with PTSD. So the individuals that participated in the

study, and in fact you had a somewhat of a control group or what you called a sham, a group who didn't receive, they were still put in a chamber and pressurized a tiny bit so they kind of experienced their ears, for example, with respect to the pressure, but the control group, if we can call it that, did not actually receive oxygen in their face masks.

Is that how the study was conducted? Correct, so you're absolutely right. So we have the treatment group doing the full hyperbaric, going to this pressure level of 2.0 atmospheres, breathing oxygen, and that specific protocol that we discussed.

But the sham group is the controlled group and they're sitting in a chamber, it looks exactly the same, And whenever you go through a hyperbaric treatment, as the pressurization is happening, you feel a popping sensation in your ears.

So the sham group got a simulation of a quick burst of pressure to feel that pressure sensation. By the end of the treatment study, when they analyzed and surveyed each group, it was statistically significant that they could not understand, was I in the Treatment group?

Was I the Sham group because, of course, oxygen is a colorless, odorless gas. When you're just breathing air versus oxygen, So in a sense, then they were fairly well placebo controlled that they did not know.

I mean, you evaluated them after to determine if they in fact knew and they really didn't.

Meet Dr. Mohammed Alamir and the Aviv Clinic

Exactly. So you evaluate the patients on the front end using a, there's a specific scale that is used in the evaluation of the PTSD patient. Can you tell us about that scale?

Yeah, this is the CAPS scale. And CAPs is a great neuropsychological tool to evaluate somebody's PTSD to diagnose and also grade how severe it is. So we administer that before and after the study treatment.

Okay, and how much treatment did these individuals receive? So they all received 60 hyperbaric oxygen treatments administered two hours a day, five days a week over those 12 weeks.

a pretty extensive treatment protocol, but the results seem to really justify that kind of intervention. After the treatment, both groups were evaluated and there were multiple ways they were evaluating.

I guess you obviously redid the scale, the PTSD scale but you did some other things as well like MRI, et cetera. Correct. So we did a lot of neuroimaging, both functional and structural imaging, the ability to measure the nerve connections within the brain, blood flow, metabolism.

In addition to seeing reduction in their CAP scores and reduction of their PTSD scales, we saw the correlative improvements on the scans, objectively correlating everything.

So you do a kind of sophisticated type of MRI scan, and in the group that was treated with the actual oxygen and pressure intervention, characterizing hyperbarics, you demonstrated increased actual connectivity within their brains in areas, for example, like the default mode network.

We don't need to define that. but just the fact that the brain was making better connections. And that's an area that seems to be a compromise in the PTSD patient.

This increase in their connectivity was not seen in at the control group? That's exactly correct. So even if they might have had some ups and downs on their scales, it wasn't statistically the same as the treatment group.

And of course, the scans also didn't show a major change. So it really confirmed that the treating made a physiologic change in the brain, which correlated with the actual improvement in their symptoms seen in this

course.

Now, I recall seeing a description, an appearance. I was at CBS this morning on one of those television programs where they actually went into the chamber in Israel with I forget which of your researchers it was, but didn't I not see this broadcast on CBS this morning?

Yeah, that's right. Dr. Afrati, he was on the broadcast. And did it get ultimately approved in Israel for the treatment of combat-related PTSD? Yes, so they've actually been doing this for years now where it got approved by their government and every single veteran that has PTSD in the Israeli army gets this treatment covered and an amazing service that they do for their veterans.

Well, and for our viewers, I would just remind you that we have had Dr. Shy Afrati on the podcast talking about his work. And I will say that many of our views know that I've been involved in hyperbarics for about 30 years.

Dr Afrate's work was really kind of instrumental in me adopting a hyperbolic oxygen therapy as part of my neurology practice. He was writing the original research on stroke recovery, in fact, demonstrating not only functional improvement in clinical evaluation, but also even improvement on CT scans in comparing patients receiving this therapy versus not.

So how did you, it was 60 sessions, I believe, of Hyperbarics. How was the actual protocol developed and chosen? Was it based upon experience with other entities, other clinical entities?

Why Hyperbaric Oxygen May Help PTSD

Correct, and the same way you found Dr. Afrati and his research was the way I did. When my late father had his stroke, that led me to research ways to help him and I found the original research using this protocol to helps stroke patients.

But when we talk about PTSD as a wound in the brain, Dr Afrati studies with stroke with traumatic brain injury, with age-related changes to the That's what led to using that protocol that has been developed over the years for this particular diagnosis and study.

And that's how they were able to develop it. So was there any difficulty in, I mean, 60 treatments is substantial. Was there a any difficult in keeping these participants engaged in following through?

Did you have any dropout, is what I'm asking. There were just a few at the beginning for the randomization and selection. I believe they started with 63 and then it went to 56 that ended up getting randomized.

So, you know, a very small attrition rate. You know it is a big commitment and as you're going through the treatment, when you sit in here and you are breathing oxygen and doing the protocol on and off with the oxygen in air, while you in in for two hours you have the opportunity to sleep, meditate, read, do cognitive exercises as a lot of our clients do.

But the process of healing the brain with PTSD is also a little bit difficult because it can bring about new memories or resurface old memories that were repressed.

So that's why it's administered with the clinical supervision. Having psychotherapists available, having the medical staff available. And we tell all of our veterans or anybody going through PTSD, whether it is the trauma of war or childhood trauma or sexual trauma, you know, the process of healing the brain can bring these memories up.

It's important to talk through them and work with clinicians so that we can help you through the Well, you know, one might think, connectivity is I think a very operative word here in terms of what is being reestablished.

And in a sense, perhaps you are establishing reconnectivity with the event or events. One wonders if that might not be an important part of the healing process to, I hate to say confront, but to be able to deal with that issue and look

at it and And as you say, with the type of therapy that's offered, along with hyperbarics, to really work through the problem that you might not have been able to be in touch with before because it was so repressed.

Correct. Often I tell my clients before they start, this isn't men in black. We're not erasing your memory. we're now erasin that trauma. But we are helping heal your brain, helping those connections so that can process those memories the appropriate way.

Without the hypervigilance, without the insomnia, or memory changes, for example. We talked a little bit about the control group, the placebo group. Was there any effect seen in that group at all in comparison to what you might have expected in somebody who is completely untreated?

So was there an effect? There really wasn't. Statistically, the scores were insignificantly changed. Whatever placebo effect that could have happened was actually negated when you look at the data, and especially when he combined the scans along with the caps and the other evaluations.

And were you able to control for other potentially confounding influences like other types of therapy, other type of medication or intervention? For sure.

So in the pre-selection criteria, we really tried to standardize other treatments that might have been confounding or medication changes. We tried keep everything controlled and stable before they were entered into the treatment and study.

So I think we're going to be, you know, sparking, oh, that's the wrong term for hyperbaric chamber. We're gonna be inducing a lot of interest in our viewers, especially as common as this problem is.

So one, I would be interested in the potential for side effects. What sort of side-effects are observed in general in this type of multi-chamber, multiplace hyperbaric chamber, or just issues that you have to deal with.

And then let's be specific about dealing with the PTSD individual in the hyperbolic chamber. So what do you tell people to be on the lookout for? Absolutely.

And a lot of the side effects are applicable to all hyperbaric treatment, whether it's a mono-chamber or multi-chamber. The most common side effect is barotrauma, trauma from pressure.

So as we close the doors and we start pressurizing the chamber, there is a popping sensation in your ears as your years are trying to equalize.

Study Design, Sham Control, and CAPS Scoring

We take about 10 minutes to get to pressure, 2.0 atmospheres is what we get you. And it's imperative that you're able to equalize. In the chamber, there's an inside attendant with you, so their duty is to help make sure you are able equalizing.

And if you can't all of a sudden, you just have to let the inside attendant know right away so we can stop the pressurization and we have some tools that can help you equalized.

The problem comes if you're a brave soul and you are embarrassed and don't want to raise your hand and say you can't pop it, you try to force it. You're going to stretch your eardrum a little bit.

The good news is it's a temporary effect. Usually you take the next day off and then you could make that treatment up on the back end. That's the number one side effect for most hyperbaric.

And how old, beyond this study, what are the youngest patients that you were able to treat? So in the study, in their 20s was the youngest, but between the clinics we have around the world, we had pediatric cases.

Young children, even as young as six years old, seven years, and usually those are related to traumatic brain injury. We have a sister clinic in Middle East that also treats for cerebral palsy and autism spectrum disorder.

The age can be as low as that. But here being in central Florida, we have a lot of villagers that are in their 90s. And then some of them can beat me at pickleball.

So we always say age is just a number. The key is when we do our evaluation that we see in the brain something can't be done physiologically. If that's the case, then we're happy to help.

So they're called villagers. You know, I was up there and I, was able to see the golf cart brigade. So you call them villagers in the villages, right?

Yeah. Yeah, so in The Villages, it's more than just a gated community. This is a large, over three county, 175,000 people. It's a whole city and community, and as you mentioned, everything's connected by golf carts.

But they are living their best lives. They're playing pickleball, golfing, part of clubs, learning new things with classes. And if they want to improve their health or treat an injury, they come here.

There you go. Well, let me get back to PTSD for just a moment. So now you've demonstrated this efficacy and we're going to flesh that out a little bit more in just But with the indication that this is a really meaningful therapy for individuals, is there a sense that offering hyperbaric oxygen therapy along with other more accepted or also proven therapies might be the way to go?

In other words, combination therapy? Yes, you know, we always believe that holistic approach is the best for every condition and PTSD is definitely no exception.

So in addition, at least here outside of the study, as we're treating people with PTSD, We are also incorporating psychotherapy, neurocognitive training.

Of course, exercise, physiology and diet are critical, As well as any medical follow up that's always done in unison together so we can get the So we've talked about the use of hyperbarics in PTSD, certainly stroke, traumatic brain injury was mentioned, but are there any specific psychiatric defined conditions that would also demonstrate benefit from this type of intervention?

Well, hi everyone, Dr. David Perlmutter here. We hope you're enjoying this content, and if you would do so, go ahead and hit the like button. And if your not already a subscriber to our channel, please consider doing so.

Were really grateful to have you as part of our community, so let's get right back to the presentation. Yes, for sure. The key is also to tie it to some brain physiology disorder.

So whether it's anxiety or depression from long COVID, so we treat long Covid as a condition and the virus can get into the brain, the inflammatory response changes the brains and a lot of folks with long covid develop anxiety and depression form the injury and those can be helped quite a bit.

Of course, with a lot of psychiatric conditions, there might not be a specific brain injury. In those, we have to be very rigorous with the assessment.

There might be some things we can help, but there may be things that we cannot. That's part of our process. We always do the thorough assessment to qualify and make sure we could help somebody before they enroll in the treatment.

Well, as it relates to long COVID, I would let our viewers know that I did have the opportunity to spend some time on the podcast with Dr. Amir Hadani talking about his research using hyperbarics to treat individuals with long Covid.

And it's pretty exciting, the results that he described. But let's get back now to the PTSD study.

Brain Imaging Results and Symptom Improvement

So as these individuals are rated on, let say their disability score that correlates with the degree of PTSD or the depth that they experience, then what did the treatment group versus the control group demonstrate?

We've talked about the improvement in functional MRI scan, brain connectivity, a brain blood supply, but what about actual rating of these individual on the scale?

Yeah, so in addition to having those objective changes on the scans, the scores on CAHPS, for example, they were lowered significantly to the point where some no longer met the criteria for PTSD.

So that in itself. And then we, of course, did some PHQ-9 and some other anxiety scores where they also were able to get rid of those conditions from a functionality standpoint.

quality of life surveys, the ability to just go back and be back at work or back with their families, having the relationships that they've lost because of their condition, all of those were significantly impacted.

And, you know, I suspect that the assessment of these individuals took place pretty close on the heels of them completing their 60 sessions? Correct. So there were basically a couple of weeks from assessment to treatment and then from treatment to post-assessment.

It was a So the obvious question is, okay, they're better, feeling a lot better. You have these wonderful scans now. Their ratings gone down dramatically on the assessment scale.

But what about a year or two later? What can you tell us about that? Yeah, with most of our studies, whether it's long COVID or PTSD, we do one and two year follow up studies.

And so far with the one year, follow-up study data, over 90% are maintaining these improvements. So they're still able to keep those cap scores low, improve their quality of life, still be able be active.

In many cases, some are doing even better at that one-year followup. And you had mentioned that this is something approved for all PTSD patients, soldiers in Israel, that they get this treatment, the government takes care of them.

What does it look like here in America in terms of our military, for example, adopting this as a therapy for our soldiers suffering from PTSD? There are a lot in the VA and in government ranks where they recognize, in fact, that this is a treatment that can help.

On that same CBS morning show program with Dr. Friday, they had some senators as well and members of the House that were all in favor. It is a matter of time.

I actually was just in Washington, D. C. speaking on behalf of hyperbaric oxygen for TBI and PTSD a few weeks ago. So there is lot of traction, especially with the new administration and new members of Congress.

It's just a manner of where this does get offered to our vets because it's sorely needed. Well, I mean, until now, the interventions have pretty much been pharmaceutical, i think.

The development of a protocol, a pharmaceutical protocol. Here's the pill, hope for the best. This is certainly a bit of an outlier in terms of just the nature of the intervention, right?

But you're getting a feeling that there's a little bit more openness now to consider I'm going to say alternative, kind of an alternative approach. Do you have a feeling there's a better environment now for considering an approach like this?

I do because I think the overall shift in medicine and governance around medicine is let's try to tackle the cause of a disease rather than a pill to treat the symptom of the disease.

And as we mentioned that, you know, PTSD is a wound in the brain and if we can heal that wound, we help heal the condition. So that just general shift and mindset I really think gives hyperbaric a great chance to help these conditions.

That's really a great point, because I've talked a lot about in my work that we need to focus on the fire, not just the smoke.

Treatment Protocol, Safety, and Patient Experience

There is, I often said, there is no treatment, no medical pharmaceutical treatment for diabetes, for example, or high blood pressure. You treat the elevated blood sugar and you treat elevated pressure, but take the drugs away and your back to where you started in one day.

you haven't fixed the problem. Whereas what you're describing here with hyperbarics is you are actually fixing the problems such that people can get can get back on the horse and resume their lives and not be dependent upon a symptom management protocol based on a pharmaceutical intervention.

So gosh, it sure seems to make sense. Absolutely. And I've always appreciated your work and your perspective, whether it's through diet and other modalities getting to the cause of a condition.

That's the way all medicine should think. Well, let's just shift a little bit to, we've kind of danced around the idea of traumatic brain injury. And I think, to be fair, there's a lot more data in TBI than there is with PTSD.

So the research looking at using hyperbaric oxygen to treat traumatic injuries seems to a be a more extensive. You know, and has demonstrated incredible efficacy.

Why is their foot dragging? Well, let me ask you, in Israel, are TBIs generally treated, at least in the military, using hyperbarics? Yeah, in the military and in civilian population as well.

And you're right, there has been a lot more and earlier interventions with TBI because traumatic brain injury is a little bit easier to think of, hey, it could be a wound in a brain from a blunt trauma.

It took some time for people to realize that post-traumatic stress is wound to the brain. That being said, also, you don't have to have a traumatic war to a have traumatic brain injury.

The number one cause of TBI in our population here in Florida is falls. So just falling and hitting your head. We have saying in the clinic, the brain does not discriminate what hurts it.

Whether it's the floor, a Ford Explorer in a car accident, or a shell shock from a cannon, injury is injury, and if you see that injury we know that this treatment can help.

Well, not to be derogatory towards the Ford Explorer, but you're right. Any and slip and fall. I mean, one would think that, you know, this coupled with occupational physical therapy, psychological therapy cognitive retraining, etc.

would be absolutely the way to go. And to There are a lot of large hospitals that have hyperbaric chambers already in place for utilization for the 13 approved Medicare indications, carbon monoxide poisoning, radiation necrosis, non-healing wounds, diabetic foot ulcers, et cetera, osteomyelitis.

You would think that it would be ultimately the right thing to do and certainly cost effective that stroke patients and TBI patients should be engaged in this type of therapy.

Why not? Absolutely, especially because the alternative doesn't exist, um, Especially with stroke and traumatic

brain injury. Um, you know, back in my previous practice in New Jersey, I was the doctor on the sideline for the Jersey city high school football association.

And there are plenty of traumatic, brain injuries on. You go through your concussion protocols to evaluate and to kind of set up a return to play. But, we know with our student athletes, all the way to the professional ranks.

There are changes days, weeks, months, and even years after a traumatic injury, And that can cause significant disability, whether it's through cognitive decline or mood changes.

So to address those early on will save the life and the cost in the long run in a medical community. For sure, we need to use these facilities that we have already.

Dr. Elamir, let me get back to something a little bit more technical. I mean, it was thought in the day that more is better, higher pressure, 100% oxygen, maybe a monoplace better than a multiplace chamber because we can really give a lot of oxygen under 2.4 atmospheres, even higher perhaps.

But the new thinking seems to be, and I know that Dr. Afrati has talked about this quite a bit. It's that that's not necessarily what's going on here.

And he talks about the delta. He talks that it's really the change that is sensed by the brain, the tissues that increases the production of this hypoxia inducible factor one alpha.

Long-Term Outcomes and Broader Uses

But walk us through how the change in oxygenation affects that chemical pathway, and then downstream, what does that pathway initiate? Yeah, you're right.

That's a very important topic, because this is what separates hyperbaric treatments, is the protocol. And the purpose of this, it is to stimulate, as you mentioned, a hypoxia-induced factor.

This is a factor that gets released in its name, in a hypoxic state, or low oxygen. The problem is I can't put my patients in the low-oxygen state because then they're actually going to have cell death.

So the next best thing is to trick the body, make it think it's in low oxygen when it is not. And you mentioned, the best way to do that is have the right delta of oxygen.

So in here, we close the doors, pressurize to 2.0 atmospheres, and we wear the 100% oxygen mask for 20 minutes. While it on, your oxygen level is 17 times higher than normal in the concentration of your plasma.

Then, after 20 min, you're asked to take the mask off. The ambient air in the chamber is 21% oxygen, normal, which is safe, but that safe normal oxygen is perceived as a low oxygen state relative to the high you were just doing for 20 minutes.

So that fluctuation of 20 minutes on high oxygen, five minutes off normal oxygen back and forth for over two hours, 5 days a week for 12 weeks is enough of a delta of oxygen concentration to stimulate hypoxia induced factor, thereby a cascade of stem cell proliferation, angiogenesis, mitochondrial biogenosis, telomere lengthening.

All of these things can happen when you have that delta. So more isn't better. You don't need to risk more barotrauma or even oxygen toxicity by going to 2.4 atmospheres if you'll get the same dose response curve at 2 point zero.

Wow. So it's so exciting. It really demonstrates You know, the value of the protocols, of looking at different protocols over time and seeing what works, and then finally discovering this whole notion of inducing this factor, hypoxia-inducible factor that is induced, you know with the change going up or down, correct, whether it goes up and down we induce this Correct.

You can go to a hypoxic state low enough to induce it, and it's a protective mechanism because in a low oxygen state, your body will recognize there's going to be cell death.

And that's what that why your wants to create new cells to replace the cells that might die. That's why it wants grow new blood vessels to help usher more blood flow to the organs that are starving with oxygen.

So you can do it that way, but you'll actually have the negative consequences of hypoxia. Now you could capitalize on it with the relative hyproxies and get those same benefits.

You know, in closing, I want to say that my visit to the Aviv Clinic was just the the word, you know words state of the art.

Mechanism of Action and Closing Remarks

I kept thinking about it. It's just a breathtaking facility. And what can you tell our audience? How can they learn more about your work and about the aviv clinic?

Absolutely. So our website, aviv-clinics.com, that's where you can directly contact us if you're interested or have any questions. All of our studies that are published, we actually have them and all the direct links to the journals on our web site as well.

And any information about all of the conditions. Our clinic is here in the villages, which is an hour north of Orlando. If you are in central Florida area, you have open tours all time.

I'm happy to speak with anybody in person or if they want to have a virtual consultation, That's great. Well, Dr. Elamir, thank you for taking time out of your day to speak to our audience.

I'm sure people learned a lot today and it's really wonderful that we can offer through this technology hope for TBI patients, PTSD patients certainly stroke patients as well.

So thanks for joining us. Absolutely. It's an honor and it's our duty to help, whether it is veterans or anybody suffering from stroke. I'm happy to helping anybody and I thank you for giving us the opportunity and thank for all the work you've done to Dr.

Bumrunner. Thank you. We'll talk soon. Bye for now. Absolutely, take care. Interesting information, isn't it? Why would altering the oxygenation of the brain have such profound effects, and yet it does?

This is what these studies have revealed in PTSD, certainly in traumatic brain injury, stroke, a variety of neurological conditions. We've talked about that before on this program.

This is therapy taking place at the Aviv clinics. That's in the villages, which is in central Florida. I've had the opportunity to visit Aviva clinics on multiple occasions, and it's really very, very impressive.