'New' Therapies for CP and Brain Injured Individuals

Hyperbaric Oxygen Therapy (HBOT) and Suit Therapy (the TheraSuit Method)

By David Deister – Hyperbaric Healing Institute

The anticipation of the birth of our first child was growing each day, and as first time parents, we wanted to be surprised about the sex of our child. Little did we know, there were to be several more surprises ahead for us.

We had just finished Christmas dinner with family and friends and were winding down the evening. All the while, my wife had been mentioning how her lower back was aching. After getting home and timing some "Baxton Hicks" contractions, we went to the hospital to be sure. An hour and a half later and three months premature, our two-and-a half pound daughter, Tatum, was born.

Tatum along with my wife and I spent the first three months of her life in the NICU, where we learned of her diagnosis – PVL (Periventricular Leukomalacia) and a Grade I hemmorhage. The doctors told us we may have a child with cerebral palsy (CP), but to just wait and see. We did not know what PVL was and knew next to nothing about Cerebral Palsy and the treatments/therapies available to cure CP. To our surprise, there is no known cure. After coming to grips with reality after our daughter was officially diagnosed at age one, my wife and I began our mission to find the best available treatments/therapies for our daughter. From conventional therapies recommended by most physicians to what are considered alternative therapies to some in this country, the next six years brought much travel, research and initiating of various therapies. What we have found to be the most beneficial for our daughter has been Hyperbaric Oxygen Therapy (HBOT) and Suit Therapy (the TheraSuit Method).

At age two, our daughter started her first series of Hyperbaric Oxygen treatments. She had very high tone in her lower extremities (CP – Spastic Diplegia) and by her tenth HBO treatment, we had witnessed a 90 percent reduction in her tone, which provided her with immediate new function. With that degree of improvement, we were certain we would continue this therapy and spent the next two years traveling across North America getting HBO treatments at several of the freestanding clinics. It was after our third trip that we decided to start a freestanding HBOT clinic in Kansas City, Missouri to make this therapy more readily available for our daughter and others like her. It was after our daughter's fifth birthday that we would include Intensive Suit Therapy as another viable treatment for cerebral palsy and other brain injuries.

What is Hyperbaric Oxygen Therapy?

Hyperbaric Oxygen Therapy (HBOT) is a method of administering pure oxygen at greater than atmospheric pressure to a patient in order to improve or correct conditions.

HBOT helps with brain injury because it is vasoconstricting, which means that it constricts blood vessels and interrupts the vicious cycle where lack of oxygen leads to tissue swelling, which in turn leads to further oxygen deficiency. By providing pure oxygen in a pressurized chamber we are able to deliver 10-15 times more oxygen than if delivered at sea level or at normal atmospheric levels. Some of the effects this has are to promote the growth of new blood vessels, decrease swelling and inflammation, deactivate toxins, increase the body's ability to fight infections, and improve the rate of healing.

The best time to begin HBOT is at the onset of the condition. In most cases though, parents, patients and physicians alike, are unaware that HBOT should be given to a brain injured person, even newborns, at the earliest possible opportunity. This however, does not mean that only children respond to HBOT. We have treated adults with cerebral palsy and other brain injuries, which have responded very well, with

improvements in both physical function and cognitive ability. So, significant brain recovery is still possible later in life. The reality that most of us have or will experience is that the physicians that treat those with cerebral palsy and other brain injuries have had no exposure to Hyperbaric Medicine during their careers, so they do not prescribe HBOT.

How can HBOT improve the Cerebral Palsy condition and other brain conditions?

When cells in the brain die, either from trauma or lack of oxygen, blood plasma leaks out into the surrounding brain tissue causing swelling and reducing blood flow. These otherwise normal cells go dormant because they can't function without the appropriate amount of oxygen. HBOT dramatically increases the oxygen carried in the blood plasma and other bodily fluids (which is normally quite low) by up to 2,000% making oxygen available to heal damaged capillary walls, preventing plasma leakage and reducing swelling. As the swelling decreases, normal blood flow can be restored to the dormant tissue (neovascularization) and these cells then have the potential to go back "on-line" and function normally.

It is at this point, you would expect to see improvement in the areas where there are deficits. Unfortunately, there are no factors (age, condition, length of time from injury, etc.) that absolutely predict or guarantee the degree of improvement. However, what we have experienced at our facility in treating neurological conditions (infants through seniors) with HBOT is that 67% received such significant benefit, that they chose to return for additional treatments…

% of Patients who Returned to HHI for Additional HBOT

Cerebral Palsy	74%
Multiple Sclerosis	71%
PDD / Autism	63%
Stroke	58%

Our findings are similar or greater than some of the more formal studies done on HBOT and its effect on Cerebral Palsy individuals. The following study was presented in November of 2000.

The Cornell Study (condensed)

Dr Maurine Packard Division of Child Development and Pediatric Neurology - Study Design

This study was designed as a randomized, delayed entry trial of the effects of HBOT on children ages 1 to 5 years with moderate to severe CP. Enrollment criteria were 1) age between 1 and 5 years; 2) moderate to severe CP; 3) no evidence of brain malformation; 4) developmental delay of at least 33% in one area; 5) no active seizures for the previous 6 months. The protocol consisted of 40 one-hour sessions of HBOT at 1.5 ATA. The sessions were scheduled twice a day, five days a week for four weeks. We did not design a double blind study, in which some children would receive placebo treatments, for several reasons. First, this was a pilot study to see if there was any evidence of benefit for these children. Second we purposefully enrolled children of various ages and disability levels to evaluate the efficacy of HBOT in a range of affected children. Third, as time in the chamber is very expensive, we wanted as much information about treatment effects as possible. Finally, it seemed unethical to have parents devote so much time and energy to a potentially ineffective treatment.

Demographics

The study population included 26 children, ages 15 months to 5 years, with cerebral palsy secondary to prenatal insults, premature birth, birth asphyxia, and post-natal hemorrhage. The subjects were enrolled at a rate of 4 per month and matched roughly to age and severity. The average age at enrollment was 30 months. The average motor age was 7.5 months; the average cognitive age and language age were both l2 months. Nine had cortical visual impairments.

Assessment

Intake assessments included a neuro-developmental assessment, Bayley II (cognitive assessment), Preschool Language Scale (language assessment), the Peabody Motor Scales (an assessment of gross and fine motor skills), Pediatric Evaluation of Disabilities Inventory (PEDI), a parental report of specific skill in mobility, self-care, and social interactions. Assessments were conducted at four time points: T1 - at enrollment; T2 -

after the immediate group received treatment; T3 prior to the delayed group's HBOT, 5 months after enrollment; and T4, after the delayed group's treatments. Two physical therapists who were blind to group status administered the Peabody and the parents completed the PEDI at all four time points. Child psychologists blinded to group status performed the Bayley II and PLS at T1 and T3.

Results

Eleven of the 12 children in the immediate group completed the 40 HBOT sessions. The twelfth child developed complex febrile seizures and was dropped from the study. Twelve of 14 delayed children received a full course of treatment. Two subjects developed seizures and could not participate. Assessments from each time point were available on 9 subjects from the immediate treatment group and from 11 children in the delayed treatment group.

Parental Diaries

The parents kept weekly diaries during the treatments. Over the month of treatments, 83% parents noted a marked improvement in mobility; 43% saw a marked increase in attention. and 39% reported a marked increase in language skills. Overall, there was some improvement with mobility in 21 of 23 children (91%), in attention in 18 of 23 subjects (78%), in language in 20 out of 23 (87%), and in play in 12 of 23 subjects (52%). One family saw no improvement and six families saw minimal improvement, a total of 30%. Five families (22%) reported major gains in skills and 11 families (48%) claimed modest gains.

Improvement in vision

Four of the 9 children (44%) with cortical visual impairment, including two infants with no functional vision, had improvement in their vision noted by the families, vision therapists and ophthalmologists.

Conclusion

Our conclusion is that, for some children with moderate to severe CP there is evidence that HBOT improves motor skills, attention, language, and play. For some, an increase in vision was noted. These are not miraculous changes. These children all still have CP, but there are substantial improvements.

In follow up interviews over 6 months, it was found that the changes in spasticity were most likely to diminish over time, but the improvement in attention, language and play remained. This increase in attention is particularly important because children must be aware of their environment in order to learn. This represents a direct impact on cognitive functioning. The main differences between HBOT and traditional therapies are the rapid gains over time and the impact on cognitive skills, which in general are not improved by PT, OT, and speech therapies. Whether these changes are the direct result of increased levels of oxygen or the intensive contact with the parent or adult in the chamber or other combination of factors should be the focus of further study.

Suit Therapy Offered at Hyperbaric Healing Institute

After years of continuing traditional physical therapy for our daughter, we finally had the opportunity to do Intensive Suit Therapy (TheraSuit Method) for her. After our first experience with this therapy, we saw substantial improvements over a two week period in comparison to months of traditional PT where no noticeable gains were made.

After subsequent Suit Therapy sessions and seeing continual improvements in our daughter, we decided to offer Suit Therapy at our clinic and opened "Beyond Therapy", a physical therapy center that offers innovative therapies including intensive suit therapy. Our mission is to help children and adults with cerebral palsy and other neuromuscular disorders achieve greater independence by providing comprehensive and intensive physical therapy programs.

Our unique approach helps accelerate progress in motor skills. Intensive therapy can provide strengthening, flexibility, increased endurance and enhanced functional skills. Many patients acquire skills such as rolling, crawling, sitting, and/or walking, which they have never been able to do prior to participating in this type of physical therapy program. At Beyond Therapy, we utilize many tools including the TheraSuit which is a modification of the Space Suit originally designed by the Soviet Space Program. The Suit is comprised of a cap, vest, shorts, kneepads, and specially adapted shoes that are connected to each other through a system of adjustable straps and elastic bands. It aligns the body, normalizes muscle tone, improves proprioception and reduces pathological reflexes.

From the onset, our only patients to utilize both HBOT and Suit Therapy were children. This group responded well to both treatment methods and continued with additional treatment. It wasn't until recently that we treated our first adult with Cerebral Palsy, utilizing both HBOT and Intensive Suit Therapy. The following information is provided by the physical therapists who worked with this patient, using Suit Therapy (TheraSuit Method).

Adult with Cerebral Palsy Utilizing Suit Therapy

Range of Motion:

Lower Extremity (passive ROM)	LEFT		RIGHT	
	(Eval)	(Discharge)	(Eval)	(Discharge)
Hip Abduction	20°	No Δ*	20°	No Δ
Hip Adduction	WFL	No Δ	WFL	No Δ
Hip Flexion	115°	110° (-5°)	115°	112° (-3°)
Hip Extension	0°	No Δ	0°	No Δ
Hip Internal Rotation	45°	50° (+5°)	30°	50° (+20°)
Hip External Rotation	35°	45° (+10°)	40°	55° (+15°)
Knee Extension (hamstrings)	Lacks 45°	Lacks 30° (+15°)	Lacks 50°	Lacks 40° (+10°)
Knee Flexion	WFL	No Δ	WFL	No Δ
Ankle Plantarflexion	WNL	No Δ	WNL	No Δ
Ankle Dorsiflexion (knee extended)	10°	No Δ	No Δ	No Δ

*No Δ - No Change

These changes were noted over a four week period of time. The patient is 26 years old.

Postural Improvements:

Before - September 13, 2004
Anterior pelvic tilt with excessive lordosis
Hips and knees flexed
Forward, protracted shoulders
Forward head posture

After - October 15, 2004
Neutral pelvis with decreased lordosis
Improved hip extension
Improved shoulder retraction
Head retraction with chin tuck

Strength: 40% - 64% increase in weight resistance from initial visit to discharge.

Endurance: Increased endurance from two minutes of aerobic activity to seven minutes before fatiguing.

Gait: Initially, the client was unable to independently correct posture (statically or during gait). Upon discharge, the client was able to independently correct posture and maintain for 10 feet before needing to be cued for re-correction.

Note: Client demonstrates leg length discrepancy of 2 cm. with pelvic obliquity. A shoe lift was recommended upon discharge. Postural improvements were more pronounced with correction for leg length. In these pictures, leg length discrepancy is uncorrected.

Closing Remarks

Hyperbaric Oxygen Therapy is not the miracle cure for those with cerebral palsy and other neurological conditions, but it is a simple treatment that is part of the solution to the most comprehensive recovery possible. HBOT combined with Suit Therapy (intensive physical therapy) is encouraged because of the benefit from muscle activation. Even though patients may have significant improvements from HBOT, Suit Therapy provides many additional benefits needed by these individuals, such as assisting to reverse changes caused by lack of use in muscles and joints.

We have had much success in treating the people at our clinic, but none of what has been achieved would be possible if not for some very talented, dedicated and caring physical therapists, respiratory therapists and nurses.

If you would like additional information on Hyperbaric Oxygen Therapy and Suit Therapy, please contact:

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