INTERNATIONAL HYPERBARICS ASSOCIATION

The Pressure Point

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Symposium Report:

News from the 4th International Symposium for Cerebral Palsy and Brain Injury

This year's 4th International Symposium in Fort Lauderdale, Florida, left attendees with a renewed sense of possibility and action on many fronts combating cerebral injury.

On the medical front, doctors, parents and exhibitors met to discuss the latest therapies and research. Topics included Stem Cell Transplantation with Hyperbaric Oxygenation, new diagnostic tests for brain injury, and prenatal and perinatal HBOT, toxic exposures and therapies, as well as new treatments in oncology, muscular dystrophy, cerebral ischemia and mitochondrial diseases.

Speakers included:

Buttar, Rashid A., DO, FAAPM, FACAM, FAAIM. Broken Pathway in Autism: The Mercury Poisoning of Our Children and their Inability to Detoxify

Campbell, Andrew W., MD. Neuroimaging of the Brains of Children Chronically Exposed to Toxigenic Molds: The Possible Role of Hyperbaric Oxygenation Therapy in Rapid Recovery

Diaz-Barboza, Jose L., MD. Design of a New Protocol: The Combination of HBO, Stem Cell Therapy, and the Application of Omentum for Spinal Cord Injuries; and Stem Cell Therapy and HBO for the Treatment of Cerebral Palsy: The Use of SPECT with this Protocol in One Patient with CP

Feingold, Giuseppina, MD. Alternative Approaches to Rehabilitation

Golden, Charles, PhD, The Effects of Hyperbaric Oxygenation on Metabolic and Cognitive Changes in Brain-Injured Patients

Hammesfahr, William, MD. Reversing Deficits from Stroke, Brain Injury, Cerebral Palsy, and Autism: Using Medications to Improve Blood Flow to the Injury

Harch, Paul G., MD. Hyperbaric Oxygen Therapy in The Treatment of Autism

Heuser, Gunnar, MD, FACP. Mild HBO Treatment as an Immune Modulator; and Pilot Study on Male Sperm Quality Improvement

James, Philip B., MB, ChB, PhD, FFOM. The Scientific Basis of Brain Repair

Mukherjee, Arun, MD, Update on the Ongoing UDAAN Multimode, Including HBOT and Early Intervention Therapy for Small Children with Moderate to Severe CP

Steenblock, David A, MD. A Pilot Study of Umbilical Cord Derived Stem Cell Therapy for Cerebral Palsy

Stoller, Kenneth, MD. Quantification of Neurocognitive Changes Before and After Hyperbaric Oxygen Therapy in a Child with Cerebral Palsy

Uszler, Michael, MD. The Present and Near Future of Functional Imaging of Brain "Injury"

Zhang, John H. Transient Exposure to HBO is a Safe and Effective Therapy for Neonates: Experimental Evidences

On the legal front, parents and caregivers were empowered with legal advice (and case law) to fight for medical reimbursement for hyperbaric therapy for hypoxic patients. Many parents and caregivers were surprised to know that children who have become disabled at birth or even accidentally through some hypoxic event are entitled to fair treatment under the law using hyperbaric oxygenation as an **approved** therapy for their hypoxia injury.

As things currently stand, traditional medicine overlooks

(Continued on page 3)

Inside this issue:

Research—Loma Linda University

Transient Exposure to HBO is a Safe and Effective Therapy for Neonates: Experimental Evidences

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Introduction

Clinical Application of HBO to acute cerebral hypoxia-ischemia is retarded partially by the limitation of the therapeutic window that most patients are not made available to HBO within the first three-six hours after the onset of stroke. An exception is the young stroke of neonatal hypoxia that a HBO chamber placed in the delivery room could save lives or reduce the neurological deficits of newborns.

Experimental Observation

We have shown using an established neonatal hypoxia rat pup model that application of HBO (1.5-3 ATA, 100% O_2) for 1 hour, at 1 hour after hypoxia insult, preserved tremendously brain weight and morphology up to 6 weeks and improved neurological function [Calvert, et al, 2002].

Mechanisms of HBO

One of the major effects of HBO at the molecular level is its anti-apoptotic action which saves the dying cells and restores their physiological functions. Using the same treatment protocol which preserved brain weight, we have found that HBO inhibited a death signaling factor—caspase-3 and its downstream effectors that mediated programmed cell death (apoptosis). HBO reduced the expression and activity of caspase-3, decreased cleavage of PARP, and prevented DNA fragmentation [Calvert, et al, 2003].

Chances of Retinopathy after HBO

A Major concern of using HBO in neonates is the possibility of retinopathy of prematurity. Using the same treatment protocol at 1.5-3.0 ATA for 1 hour, we evaluated the retinal response to HBO from 24 hours to 10 weeks. Retinopathy was evaluated by the degree of neovascularization (measuring retinal vascular density), by the structural abnormalities (histology) in the retina, and by the expression of hypoxia-hyperoxia sensitive proteins including hypoxia-inducible factor 1a (HIF-1a) and vascular endothelial growth factor (VEGF).

We found no signs of neovascularization, no abnormalities in the structure of the retina, and no changes in the protein expression of HIF-1a and VEGF after hyperoxia exposure [Calvert et al., submitted to Experimental Neurology].

Conclusions

Transient exposure to hyperoxia at hyperbaric pressures prevented brain injury by inhibition of apoptosis. This effective treatment does not cause retinopathy of prematurity.

Research Abroad—UDAAN Project, India

Update on the Ongoing "UDAAN" Multimode, Including HBOT and Early Medical Intervention Therapy for Small Children with Moderate to Severe Cerebral Palsy

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Childhood disorders, characterized by neurodevelopment delay, lead to an increasing gap between normal development curves and that of special needs children as the years pass. There have been a number of medical intervention therapies that have tried to reduce this gap to augment the quality of life of special needs children.

One of these measures is Hyperbaric Oxygen Therapy (HBOT) for small children with cerebral palsy. Even though many studies have shown significant benefit with HBOT, the puritans do not accept it, citing the increased attention that any trial provides as the reason for the enhanced development.

The UDAAN Multimode study tries to answer that aspect. We have given 20 small children only standard therapy [OT, PT, special education and speech therapy] in an intensive regimen of each of the four, on a one to one basis, for one-half hour each daily, and compared the results to 40 small CP children given the same intensive standard therapy in the same way by the same set of therapists at the same venue using the same equipment, plus adjunct therapy with 40 sessions of HBOT, followed two months later by 60 sessions of CP specific acupuncture, 90 days of aruvedic neuro-restorative therapy and nerve block where required. (This total regimen is called the UDAAN Multimode Therapy for CP.)

The results show that non-HBOT based standard therapy indeed induces a small hump upwards within two months, which regains the old curve by six months, through at a higher plane.

By contrast, the HBOT plus standard therapy group had a rising curve right from the beginning, which increased its curvature sharply after two months, and then reduced its curvature partially between the fourth and sixth months. The change in level at six months was significantly higher than the non-HBOT group. The curvature pattern also showed a continued up-curve at six months, compared to the baseline curve as shown by the control group getting standard therapy only.

When we plot the change from baseline state over six months, the rise shown by the HBOT regimen is just about twice as much as the on-HBOT group. The results indicate that HBOT-based Multimode Therapy may offer a better quality of life faster to small children with CP as compared to standard therapy alone. Many of the HBOT group children achieved ADL within 6 months to a year.

Research in Scotland—The Scientific Basis of Brain Repair

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Introduction

Until recently, it has been accepted that when growth of the central nervous system of mammals is complete, new cells cannot form, and the explanation for any recovery seen following damage is plasticity. Plasticity must be an important mechanism, as patients have recovered from the hemiplegia associated with the loss of a hemisphere and, experimentally, recovery of function has been seen following surgical hemisection of the spinal cord. Both have been recorded without the use of any treatment.

More than 20 years ago, Gelderd, et al., demonstrated that regrowth of nerve fibers is possible in the spinal cord after surgical trans-section, provided additional oxygen is delivered under hyperbaric conditions. This study confirms that there are equivalent mechanisms operating in the spinal cord to those responsible for the regeneration of the peripheral nerves. CT has also shown remyelination following ventricular enlargement after cardiac surgery in children, and evidence has also been provided for the remyelination of nerve fibers within the central nervous system by peripheral myelin.

An MRI study of taxi drivers has shown enlargement of the hippocampus, suggesting that new nerve cells are formed in response to the demand for additional memory, and in the last decade, stem cells have been found within the adult human nervous system.

Proof that new brain cells can be formed has, however come from bone marrow transplantation. The first indication of the ability of bone marrow stem cells to migrate into organs came from the post mortem examination of hearts from female donors that had been transplanted into men. The female hearts were found to contain new muscle cells with XY chromosomes. These new muscle cells must have developed from stem cells derived from the bone marrow of the male recipients that had migrated from the blood through capillary walls into the muscle tissue.

This is the basis of the latest treatments for heart failure in which stem cells are injected into the coronary circulation to repair heart muscle. Now evidence of stem cell migration into the brain has come from the post mortem examination of female patients who have received bone marrow transplants from male donors. Nerve cells with XY chromosomes have been found in the hippocampus, which could only have derived from the male donor bone marrow.

This research has provided unequivocal evidence that stem cells from bone marrow can migrate from the circulation across the blood-brain barrier into the tissues of the brain. This suggests that, far from being an organ fixed at a point in time, the brain is capable of forming new cells and neural connections. This probably occurs throughout life from host bone marrow stem cells.

An adequate microcirculation and blood flow are a requirement for tissue repair, and data from the hypoxia induced by altitude has shown that new capillary formation can also occur in the adult human brain. Damage to any tissue includes the microcirculation it contains, and recovery depends on the presence of sufficient oxygen.

A mild reduction below normal oxygen levels has been shown to up regulate the genes required for the production of the vascular endothelial growth factor responsible for new capillary formation, but a severe oxygen deficiency must be corrected to allow the production of the ATP necessary for recovery.

Hyperbaric oxygen treatment can prepare the soil for the seed and we now know that "bone marrow can make brain."

Symposium Report: 4th International Symposium (conclusion)

(Continued from page 1)

the fact that "hypoxia"—lack of oxygen—has caused the initial insult to the brain, and instead, sets up entire protocols for "maintaining" the effects and symptoms of the injuries (CP, brain injury, feeding issues, hypotonia, spasticity, blindness, etc.) with usually grim prospects for quality of life. The position of the medical profession is generally not proactive, since these injured patients are seen as too severely damaged and unrecoverable, using standard medical practice.

During a panel discussion for parents, David Freels, writer for *Hyperbaric Medicine Today*, urged parents and caregivers to start a letter writing campaign to congressional representatives, demanding that their injured family-member's '*hypoxia*' not be overlooked simply because conventional medicine has labeled the condition "cerebral palsy," "brain injury" or some other "incurable" condition for which the medical profession has given up hope.

In addition, Julie Gordon from MUMS (Mothers United for Moral Support) urged parents to save denial letters from insurance companies and medical agencies so that legal cases of medical discrimination could be brought forth by parents seeking reimbursement for hyperbaric therapy.

State and Federal law currently states that a person cannot be discriminated against medically simply because of their medical condition. Denying a treatment otherwise given for hypoxia cannot be withheld simply because the patient's symptoms are overwhelming and deemed impossible to cure.

For more information regarding this symposium and/or abstracts, please contact the IHA. As a final note, the IHA would like to thank speakers for their contributions to the hyperbaric field.

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The International Hyperbarics Association is a coalition of doctors, parents, patients, corporate chamber-industry professionals, hyperbaric center owners, and above all members who are committed to the cause of medical hyperbarics.

Our members come to us from all geographical areas with one common goal— to share their knowledge and information regarding the latest hyperbaric news.

Our driving force is our members, who are committed to do all we can "to give life to the world."

— **"Mundo vitam dare"**

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