

High-dose Oxygen Therapy for Cerebral Palsy and the Brain-injured Child (Documentation via SPECT Imaging)

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Summary

Cerebral palsy is a term that encompasses any type of brain injury in children under fourteen years of age. Etiologies vary from in utero problems to unfavorable delivery situations to postpartum complications. Any major illness including infections, vaccine reaction, traumatic brain injury, anoxic encephalopathies, seizure disorder, or genetic problems involving children under the age of fourteen is basically classified as cerebral palsy, which is a "catch-all" term. The majority of the patients treated at the center were under the age of five years.

Introduction

Positive effects of hyperbaric oxygenation have been reported from fourteen countries worldwide.⁽¹⁾ Documentation with functional imaging originally instituted at the Ocean Hyperbaric Neurologic Center,⁽²⁾ is now becoming a standard procedure. This consists of functional brain imaging with single photon emission computerized tomography (SPECT) scanning before, during, and after hyperbaric oxygenation which has effected improved flow and metabolism with 82 percent clinical correlation.⁽³⁾ In certain areas of the world the damaged newborn is taken from the delivery room immediately to the chamber.^{(4) (5)(6)}

In Italy, when the abnormal fetus has placental problems, the mother is treated with hyperbaric oxygenation and usually has a normal delivery.⁽⁷⁾

Materials and Methods

Three hundred and sixty cases have been treated at the Ocean Hyperbaric Neurologic Center over the past five years. Each patient received a SPECT scan using an Elscint single head gamma camera with high resolution to acquire the images. The tracer used was Technesium 99 either Ceretec or Neurolite. The patient then received from twenty to several hundred exposures of hyperbaric oxygenation with sequential scanning. Hyperbaric oxygenation was administered in a monoplace Vickers chamber with pressures between 1.1 ATA (low-pressure for seizure disorder) to 1.75 ATA. In only one instance were myringotomy tubes required. (The Ocean Hyperbaric Neurologic Center has the lowest incidence of ear problems of reported centers around the world).

Case Reports

(Three clinical cases studied at the Ocean Hyperbaric Neurologic Center are presented).

C Flores

Five-year-old white female who was born with severe combined Immunodeficiency. At age eight months she underwent a bone marrow transplant to correct the immune disorder. During the surgery she had a cardiopulmonary arrest requiring resuscitation that took twenty to thirty minutes, causing cerebral palsy and anoxic ischemic encephalopathy. She also had an episode of pneumonia. EEG showed no seizure activity but did show cortical blindness prior to hyperbaric oxygenation. Patient received Botox injections in the hands and lower extremities prior to hyperbaric oxygenation. Patient received 177 hyperbaric oxygenation treatments at 1.5 ATA, one hour each exposure. Prior to hyperbaric oxygenation the patient was basically aphasic, unable to walk, unable to turn over or hold her head up.

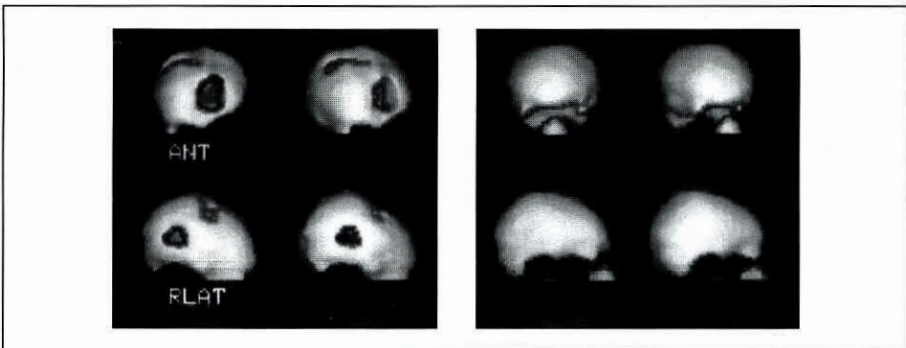


Fig. 1A & 1B

After hyperbaric oxygenation treatments, she is now more verbal, walks with AFO's, and the spasticity was significantly reduced. The family considered the progress to be remarkable. The brain SPECT scans paralleled the dramatic improvement with the clearing of primarily the left frontal, temporal, and parietal deficits. Although limited views are displayed, the entire scan shows that the patchiness in other areas from the A.I.E., showed remarkable clearing.

MM

Patient is a 4-year-old female diagnosed with cerebral palsy at six months of age, suggested by poor developmental skills and confirmed by CT. Although birth was normal, it was found that mother had CMV. Patient had made minimal progress, was able to roll from side to side, but was not able to turn over. There was no speech formation and she required hearing aides. There was no known visual defect. She was able to

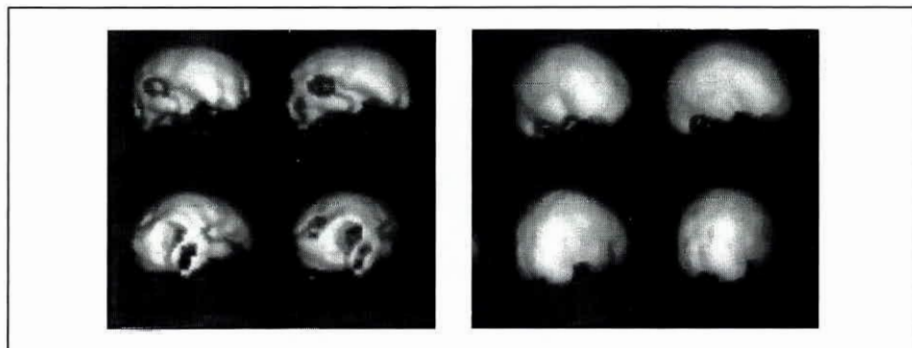


Fig. 2A & 2B

eat soft food and drink Pediasure. She exhibited poor awareness, but responded to visual and tactile stimulation. Initial brain SPECT scan showed marked patchy areas of hypoperfusion, especially in the right temporal and occipital lobes, with some thinning of the left frontal lobe. After 11 HBO treatments, she was less spastic, more verbal, showed more personality, and had a better appetite. After 33 hyperbaric oxygenation treatments, patient was stronger and started to pick herself up. Repeat scan after 70 treatments showed marked improvement. After a total of 99 hyperbaric oxygenation treatments, she was much stronger, able to sit up, able to hold her head up very well, and was eating solid foods.

RS

This white female patient was twenty-one months old when she was first treated at the center. She was born with the umbilical cord wrapped

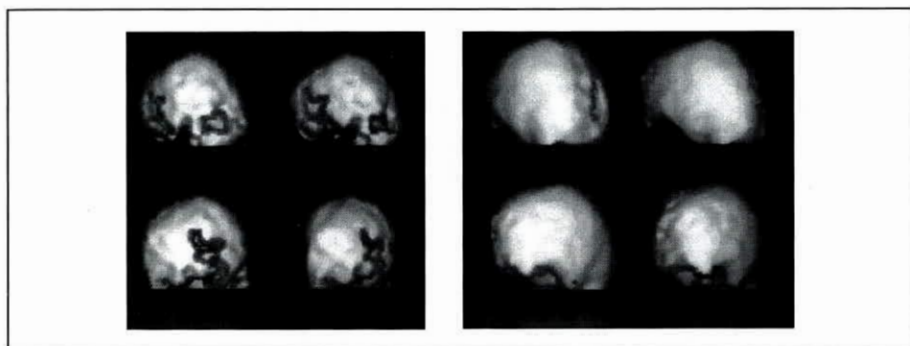


Fig. 3A & 3B

around her neck causing cerebral palsy. The patient was semi-vocal, unable to crawl, and low on the cognitive scale. She was able to hold her head up. There was some scissoring with spasticity. The patient received 151 hyperbaric oxygenation treatments between the dates of 1/16/99 and 7/28/99. Upon discharge the patient was able to walk with a walker. When pushing up with her arms and curling her legs, the scissoring is now less. Her head control was better and she had more range of motion. Her cognitive and vocal areas had improved. The brain SPECT scans showed substantial improvement in cortical function. Long-term follow-up on this patient shows that she has now had over 400 hyperbaric oxygenation treatments in Canada. She is going to school and is now leading pretty much of a normal life with the exception of her speech which has not fully returned.

Results

Overall there were varying degrees of major positive effects in approximately eighty percent of the patients.⁽⁸⁾ A significant reduction of spasticity,⁽⁹⁾ along with improved cognition, weight gain, and increased awareness was noted in nearly all the children. Return of vision with those due to problems with occipital damage was significant. G-tubes and tracheotomies were able to be removed in over sixty-five percent of the patients. Positive changes in flow and metabolism noted with SPECT imaging highly paralleled the clinical status⁽¹⁰⁾ (as noted in a research project completed by Nova Southeastern Medical School using the above patients and data). All modalities of physical therapy, occupational therapy, speech therapy, biofeedback, acupuncture, and appropriate nutritional counseling were continued.

It has been shown that dormant idling neurons may regain function and have their myoneural pathways re-established for period up to twelve years.⁽²⁾

Conclusion

A major conference ⁽¹⁾ with speakers from fourteen countries around the world attested to the fact that hyperbaric oxygenation is an important therapeutic modality with the cerebral palsy and brain injured child. Results are reproducible on a worldwide basis. The earlier the treatment is started, the more optimum the results. The Italians treat the small or possibly damaged fetus by placing the mother in the chamber resulting in normal deliveries. In certain centers the premature and the maimed infant is taken from the delivery room to the chamber.⁽⁴⁾⁽⁷⁾ In certain instances as little as one hour of hyperbaric oxygenation may turn the entire life around for the child.⁽⁴⁾ Seizure disorder was not a contraindication, but actually an indication for this type of therapy.⁽¹¹⁾ For this to become an acceptable modality, it will be necessary to document the clinical data. It is hoped that more centers will become involved with this therapy. To date, all patients have served as their own control.

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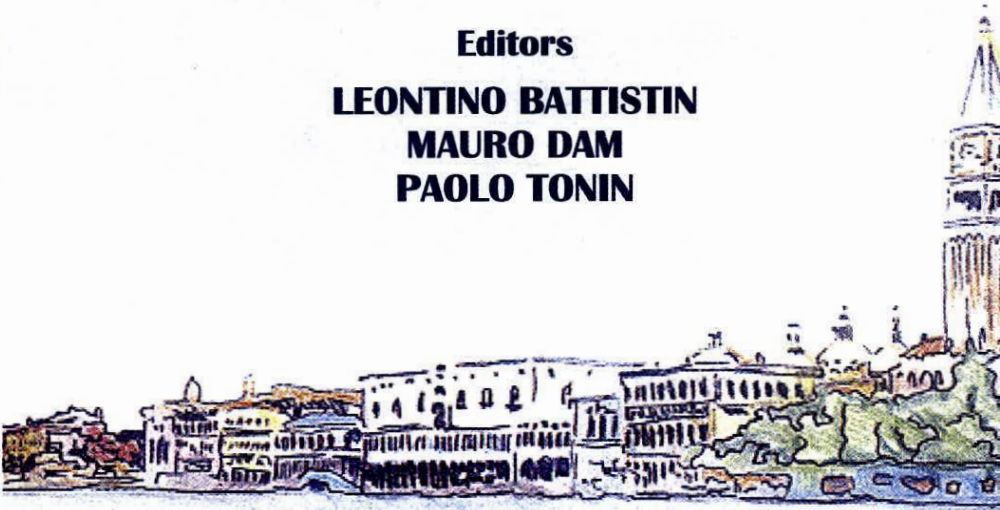
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