CLINICALLY OBSERVED REDUCTION OF SPASTICITY IN PATIENTS WITH NEUROLOGICAL DISEASES AND IN

CHILDREN WITH CEREBRAL PALSY FROM HYPERBARIC OXYGEN THERAPY

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INTRODUCTION

Our personal experience with hyperbaric oxygen therapy (HBOT) in patients with neurological diseases started in 1979. From that time we have used it as an adjunct to physiotherapy in the rehabilitation of these patients.

In the first four years, we worked with patients suffering from ischemic cerebral vascular accidents, and verified that the clearest and most common effect of HBOT during treatment and soon after it, was a reduction of spasticity. This was obvious clinically and functionally in hemiplegic patients and preceded motor improvements.

During 1984-85, we accumulated experience with the HBOT in other pathologies, including head injury, anoxic-encephalic disorders and multiple sclerosis patients. The same results were found.

We then decided to investigate the effect of HBOT on children with cerebral palsy – another predominantly spastic disease. In 1985, we started working as neurological advisors for the "Centro Brasileiro de Medicina Hyperbarica" (CBMH) and selected a group of 10 children with spastic cerebral palsy who may benefit from HBOT, as they had respiratory difficulties, bronchitis, repeated pneumonia and bronchial asthma. An HBOT treatment programme was devised for this group and we observed the same reduction of spasticity in these patients. Also there was improved respiratory function, the bronchial complications disappeared and this was confirmed clinically.

This initial success then led to other problems as the physiotherapists sent us other cases to be treated. The parents of affected children contacted us to try HBOT in their children. We let them know that we could find no references to this

in our literature, and such a therapy, whilst harmless, could be unnecessary or even present temporary side effects. However, despite this, they insisted on trying it.

We then looked for assistance from other specialists, including those in our University, in order to conduct scientific research on the matter, but had no support.

The CDMH is a private medical office, one of the few hyperbaric medicine centers in Brazil. We have commercial or corporate participation in the centre but we have since had to interrupt our collaboration, because of problems generated by accepting these patients.

We found that HBOT is little known in Brazil and is considered to be "alternate medicine" by physicians, who only recognise its merit in respect to the treatment of gas gangrene.

We made a proposal last year (1988), to neuropodiatrists at the Hostpial das Clinicas, in the Faculty of Medicine of the University of Sao Paulo, to fund a double-blind study with their patients, without our participation. They refused, stating that they were not aware of the scientific basis of the treatment and because the chambers were not in the University.

We thought the Fasaji and Abe technique would be a way to produce scientific evidence of the reduction of spasticity. We have been asking for electromyography in our city for four years, and also in other States in Brazil, so that we could perform such a study in our patients. However we were told that the necessary equipment was not available, and in addition there was a lack of personal experience with the technique.

Dr. Richard Neubauer has now asked us as a matter of urgency to present our observations, based simply on our clinical findings and without scientific documentation. We have agreed to this because we are convinced of the therapeutic value that HBOT represents for neurological diseases evidenced by the reduction of spasticity and believe that divulging this information might stimulate the necessary scientific research.

CASE STUDIES

A review has been made of the neurological cases that we have been personally evaluated at GBMH, from January 1985, to April 1989. We found 1,082 cases, 473 of whom had been diagnosed as Cerebral Palsy (CP) and 230 patients with this pathology had received at least a series of HBOT (20 sessions of 1 hour) and had been appraised before and after the therapy.

Within this period, we found: 75 patients who had suffered Cerebral Vascular Accidents (41 of them given HBOT), 37 cases of encephalopathy due to hypoxic events (25 treated with HBOT), 35 cases of head injury (19 of them received HBOT) and 10 cases of multiple sclerosis (3 of them treated with HBOT).

Our experience with the group affected by Cerebral Palsy, which we believe to be the most significant condition as it is the most frequent, is presented below.

a. **Age**

   Features of the Group of Patient with CP:

   2 patients at less than 1 year (0.86%)

   115 patients from 1 to 5 years (50%)

   7 patients from 5 to 10 years (37.82%)

   ?6 patients from 10 to 15 years (11.30%)

b. **Residence**

   108 patients from out State

   122 patients from other States of Brazil (53.04%)

c. **Birth Details**

   Concise medical information about low score in Apgar were obtained in only 19 (8.26%) patients; however, in other 104 (45.21%), there was a history of sever perinatal hypoxia.

   Caesarian operations were performed in 98 (42.60%), forceps in 16 (6.95%).

   Prematurity was reported in 50 cases (21.73%) and 10 (4.34%) of patients were adopted, the birth details were thus unknown.

   There were also history of pelvic presentation in 9 (3.47%) patients, 8 (3.47%) of twins and 6 (2.6%) of them had early placental separation.

d. **Prior Medical History**

   A history of repeated bronchitis, pneumonia and bronchial asthma were obtained in 40 (17.39%) patients. Orthopedic surgery (tenotomies) for the connection of spastic deformities had been undertaken in 31 (13.47%)

patients and sterotaxic ceurological surgery had been performed in 2 (0.86%) patients.

Significant epileptic events had been experienced by 101 (43.91%) patients (excluding those who had suffered them during the first six months with just a fever crisis or had only one event).

Only 96 (41.73%) made use of daily physiotherapy in specialized clinics, the others being attended by relatives, or with no physiotherapy at all.

e. **Pre-HBOT Neurological examination**

A spastic form of CP was present in 230 patients. The spasticity was clinically appraised by the clinicial signs: spastic muscles, sever hypereflexia, a Babinski response, clonus, postural deformities and articular angulations.

The plantar support and the gait were noticed. In time a spasticity index was developed from 0 to 100 for each affected limb.

We saw the following signs:

Paraparesis, in 16 cases (6.95%);

Tetra (or quadra) – paresis in 188 cases (81.73%);

Hemiparesis in 24 cases. (10.43%)

Triparesis in 2 cases (0.86%)

in addition to spastic paresis in the limbs, strabismus was noticed in 86 (37.39%) patients, associated speech disorders in 56 (24.34%) and ataxia in 30 (13.04%)

f. **Pre-HBOT Additional Examinations**

An electroencephalogram was performed in 189 (82.17) patients, with:

Normal – 101 (53.43%) cases;

Altered – 88 (46.56%) cases.

Patients presenting frequent convulsive crisis were advised as to the medication to be used, and we waited for 3 months to start the HBOT therapy, after the episode had resolved.

Computed axial tomograph (CAT scan) was performed in 146 (63.47%) patients, with:

Normal – 43 (28.45%) cases

Altered – 103 (70.54%) cases

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The alterations would range from slight cortical cerebral atrophies to sever cortico-subcortical cerebral atrophies. The finding of subcortical cerebral atrophy was the most frequent, in this series of patients.

g. **Hyperbaric Oxygen Therapy**

A series of 20 sessions of HBOT lasting 1 hour each at 1.5 ATA was made, in a rate of 1 or a maximum of 2 hours/ day, in monoplace Vicker chambers, with a total of 230 patients. Practically all patients were alone, but were calm in the chambers during the treatment (even the most excited), looked comfortable.

Convulsions were seen in just 4 (1.73%) of patients, during period of treatment, but not in the chamber, with no serious consequences and this led to an increase in anticonvulsive drug therapy in 2 (0.86%) of patients, with a short interruption in the HBOT.9 (3.91%) patients were voluntarily brought by their families, who insisted in performing a second series of HBOT after 1 year. 2 patients made a third series under the same conditions. We had pointed out that the cost of a HBOT series at CBMH is relatively high for the treated population (nearly US$ 1,000).

h. **Results**

Neurological Examination immediately after HBOT

We found that in 218 (94.78%) patients, there was a clear reduction of spasticity (nearly 50% less, assessed by our index). Frequently, the

clonus or the Babinski sign would disappear, with better plantar support and abolition of the leg "scissoring."

12 patients (5.21%) remained practically unchanged. There were extremely severe cases, with sever cerebral atrophy on CAT-Scan.

Each patient served as their own control.

i. **Follow-up**

The follow-up of patients over a period of 6 or more months after HBOT was only possible in 82 (38.65%) patients, since most of them did not live in Sao Paulo.

We noticed that 62 (75.6%) of patients had persisting reduction of spasticity and improved motor control. In addition, the parents reported other improvements, such as a better balance, the child being more attentive and more "intelligent," with a reduced frequency of convulsions and episodes of bronchitis.

20 patients (24.39%) were apparently unchanged, and in some cases the physiotherapy was interrupted, after HBOT. Only one of the parents of a patient found that his daughter had become worse, developing convulsions some time after the course of HBOT. We learned that her electroencephalogram had not been normal 2 years before.

DISCUSSION

HBOT has already been used for some classical indications in neurology, in lesions involving hypoxia and ischemia, but the reduction of the spasticity present in different neurological diseases has not, as far as we know, been described before. We do not know why oxygen at high dosage seems to be more beneficial to some area of the brain. Although our study can be criticised for not using traditional scientific methodology, we believe this effect, based on our clinical observation is genuine.

Spasticity is a functional disturbance, arising from the hyperactivity of motorneurones from the loss of inhibition exerted by upper nervous centres and the reticular formation.

While the degree of spasticity might vary slightly in the same patient, under given conditions and with the evolution of a disease, it tends to stay nearly stable in chronic diseases of the Central Nervous System, such as Cerebral Palsy.

We feel that a significant reduction of spasticity implies better performance of the nervous system, as a whole.

Conventional HBOT, as designated by Holbach et al for neurological patients, was used. We have also used HBOT for CP cases. We work in a country that sadly seems to be the record holder for the disease, affecting at least 750,000 patients in the USA.

Perhaps we have been encouraged by the patients, to place attempts at therapy before research (but) we do believe that oxygen at higher dosage plays an important role in the rehabilitation of neurological patients, and has a favorable effect on neurological development in children. We expect subsequent studies will confirm this.

Last, but not least, we would like to use Landau's words about research and the therapy of spasticity:

"There need be no apology for tackling only a symptom rather than an etiology; the misery of these patients cannot wait."

This study is not conclusive, its presentation being intended to register our clinical observation that one of the noticeable effects of hyperbaric oxygen therapy in neurological patients is the reduction of spasticity.

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