

How and why hyperbaric oxygen therapy can bring new hope for children suffering from cerebral palsy – *An editorial perspective*

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Cerebral palsy (CP) is generally considered a non-progressive condition resulting from neurological injury in the antenatal or perinatal period. The increased survival rates of premature infants due to advances in neonatal intensive care has led to increased incidence of CP, which is now higher than three in 1,000 births. Perinatal hypoxic-ischemic (HI) events resulting in cellular necrosis, neuronal inactivation and cerebral white matter injury are the most common causes of severe neurological handicaps in children with CP.

The challenge

Physiologically, hypoxic-ischemic brain injury could be defined as acute oxygen and nutrient deprivation to the brain caused by faulty cerebral circulation, resulting in cellular bioenergetics failure and neurological dysfunction. As in stroke, traumatic brain injury (TBI) and age-related metabolic brain disorders, there is no effective treatment/metabolic intervention in routine clinical practice for children with CP. Intensive therapy and rehabilitation programs are valuable tools for improving the quality of life for these unfortunate children, but they offer, at best, only partial relief.

New results

In this current issue of *UHM*, Mukherjee *et al.* present convincing evidence that hyperbaric oxygen (HBO₂) therapy in combination with standard intensive rehabilitation (SIR) could be the coveted neurotherapeutic method for children suffering from neurological dysfunctions due to CP [1]. The idea that HBO₂ therapy can provide a valuable brain repair tool for CP is not new and has been investigated in several

earlier clinical trials, but the results were conflicting [2-6]. What makes the current findings persuasive is the methodical, multifaceted comparison: The short-term and long-term outcomes of SIR in conjunction with normal air (21% oxygen) HBO₂ sessions at 1.3 atmospheres absolute (atm abs) were compared with those of SIR in conjunction with:

- (a) 100% oxygen HBO₂ sessions at 1.5 atm abs and
- (b) 100% oxygen HBO₂ sessions at 1.75 atm abs.

For long-term follow-up, patients were evaluated two and eight months after the beginning of treatment. Interestingly, significant long-term beneficial effects were observed for all combined treatments, including the case of normal oxygen at 1.3 atm abs, compared to SIR alone.

A call for consensus

While the findings support the idea that “low-dose” HBO₂ can provide new hope for children with cerebral palsy, additional, larger-scale clinical studies are needed to further confirm the findings and determine the most effective and personalized treatment protocols. Furthermore, before initiating future clinical trials, some issues associated with the optimal practice of HBO₂ therapy for children with CP should be explored:

- proper sham control;
 - the optimal dose-response curve (oxygen and pressure levels);
 - the optimal treatment duration/number of HBO₂ sessions; and
 - the proper selection criteria of the study cohort.
- Further below we reflect on the optimal HBO₂ therapy practice in light of the recent findings by Mukherjee *et al.* – of new understanding of the brain damage