

What's the Evidence?

Hyperbaric Oxygen Treatment for children with cerebral palsy?

Key findings

- Hyperbaric Oxygen Treatment (HBOT) involves breathing 100% oxygen through a mask while inside a sealed chamber that has been pressurised to greater than normal atmospheric pressure.
- From the research that we have reviewed it is not clear whether there is any beneficial effect of HBOT for children with cerebral palsy.

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What were we asked?

We were asked about the effectiveness of hyperbaric oxygen treatment for cerebral palsy.

What is Hyperbaric Oxygen Treatment?

Hyperbaric Oxygen Treatment (HBOT) involves breathing 100% oxygen through a mask while inside a sealed chamber that has been pressurised to greater than normal atmospheric pressure.

It is typically very time intensive, with each session lasting 60-80 minutes and sessions taking place 5 or 6 days of the week for a total of around 40 sessions. Some people believe that HBOT may be effective for children with cerebral palsy. Note that HBOT is not available as a mainstream treatment for children with cerebral palsy through the NHS.

What did we find?

The Agency for Healthcare Research and Quality (AHRQ, an American government agency) reviewed the literature surrounding the use of HBOT for brain injury, cerebral palsy and stroke in 2001 (and updated in 2003).¹ In relation to cerebral palsy, they conclude that...

'There is insufficient evidence to determine whether the use of HBOT improves functional outcomes in children with cerebral palsy.'

The only randomised trial included in the AHRQ review involved 111 children with cerebral palsy aged 3-12 years. The results indicate that, when compared with children receiving 'slightly' pressurised air (a placebo treatment), children receiving HBOT did not improve in measures of motor function (as assessed with the GMFM,

a clinical tool which measures gross motor function), performance in activities of daily living, attention, working memory or speech. However, both groups showed improvement, leading the authors of the RCT to suggest that the benefit of both pressurized air and of HBOT at 1.3 to 1.5 atm should be further evaluated. What is not known is whether the children would have improved anyway without this treatment.

The [AHRQ review](#) also notes two uncontrolled studies that found improvements in functioning, similar to that observed in both groups of the randomised controlled trial described above. In addition, study participants reported reductions in caregiver burden; though neither of the studies provided measurement of this outcome.

From the research that we have reviewed it is not clear whether there is any beneficial effect of HBOT for children with cerebral palsy. There are some potential adverse effects; ear problems have been reported, and are a known potential adverse effect of HBOT, but the incidence, severity and effect on outcome are unclear.

The authors of the AHRQ review [re-examined the evidence](#) surrounding HBOT for children with cerebral palsy in 2007, including any new evidence that had been published since the last review. However they conclude again that..

'The evidence is inadequate for establishing a significant benefit of HBOT, or for identifying

*potential adverse effects of HBOT, for treatment of children with CP.'*²

Since the 2007 AHRQ review, we have identified 3 further studies which look at the use of HBOT for children with cerebral palsy. All three studies looked at the use of HBOT to improve movement ability (the ability to sit, stand and walk) as well as activities of daily living (self-care, mobility, social functioning).

A randomised controlled trial published in 2012 allocated 49 children aged 3-8 years with spastic cerebral palsy to receive either HBOT or 'slightly' pressurised air as the control treatment. Movement ability was judged by an independent researcher who did not know which treatment the child was receiving. No improvement was found in the movement ability of children in either group, nor was there any difference between groups. Parents reported improvements in self-care, mobility and social functioning in both groups, with no difference between groups. The trial was stopped early because the chances of it showing any differences between the two treatments were too small.³

In contrast, the other two studies report beneficial effects of HBOT. A 2014 controlled study assigned 150 children aged 1 to 17 years with cerebral palsy to either receive HBOT and standard rehabilitation, pressurized air and standard rehabilitation, or standard rehabilitation alone. They found an improvement in movement ability across all children, however improvements were significantly bigger in those children

receiving HBOT or pressurized air compared to those on standard rehabilitation. It is important to note that there were many factors which may have biased this study: 1) this was not a randomised study - it was the parents' choice whether their child received HBOT or standard rehabilitation alone; 2) the evaluations were not blind - researchers knew which children had received HBOT and this may have influenced their measurements. ⁴

In 2017 a further randomised controlled study was published in which 200 children aged 5-14 years were randomly allocated either HBOT or standard rehabilitation only. They found that the children receiving HBOT had significant improvements in both movement ability and general functioning in daily life compared to those receiving just standard rehabilitation. Participants in this study were randomised and evaluations were blind, however the children in the

control group didn't receive a 'placebo' or 'sham' treatment.⁵

The use of 'sham' treatments in HBOT trials is hotly contested. HBOT has two active ingredients: pressure and oxygen. It has therefore been suggested that trials which use pressurised air as a placebo are in fact giving a partial treatment. There is currently no agreement as to what an appropriate placebo would be for these kinds of studies.

What do we think?

From the research that we have reviewed it remains unclear from rigorous research whether there is any beneficial effect of HBOT for children with cerebral palsy.

There are some potential adverse effects, but the incidence and severity of these are not well reported or understood.

We would like to hear your feedback on this summary – please email us at pencru@exeter.ac.uk if you have any comments or questions.

References

- 1 McDonagh, M. S. et al. (2003) Hyperbaric Oxygen Therapy for Brain Injury, Cerebral Palsy, and Stroke. *Agency For Healthcare Research and Quality*. [Online] Available at <http://archive.ahrq.gov/clinic/tp/hboxtp.htm>
- 2 McDonagh, M. S. et al. (2007) Systematic review of hyperbaric oxygen therapy for cerebral palsy: the state of the evidence. *Developmental Medicine & Child Neurology*. 49(12): 942-47.
- 3 Lacey, D.J., Stolfi, A., & Pilati, L, E. (2012) Effects of Hyperbaric Oxygen on Motor Function in Children with Cerebral Palsy. *ANN NEUROL*. 72:695–703.

4 Mukherjee, A. (2014) Intensive rehabilitation combined with HBO2 therapy in children with cerebral palsy: A controlled longitudinal study. *Undersea & Hyperbaric Medicine*. 41(2): 77-83.

5 Azhar, M.J. et al. (2017) Evaluation of Role of Hyperbaric Oxygen Therapy in Children with Cerebral Palsy: Our Experience at Armed Forces Hospital, King Abdul Aziz Naval Base, KSA. *EC Paediatrics* 6(3): 67-73.

Note: the views expressed here are those of the Peninsula Cerebra Research Unit (PenCRU) at the University of Exeter Medical School and do not represent the views of the Cerebra charity, or any other parties mentioned. We strongly recommend seeking medical advice before undertaking any treatments/therapies not prescribed within the NHS.