Evidence-based review:

Hyperbaric oxygen therapy (HBOT) reduced the incidence of cognitive sequelae following carbon monoxide poisoning

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Clinical bottom line

1 HBOT significantly reduced the proportion of patients with cognitive sequelae at 6 weeks (NNT = 5).
2 This effect may persist for 12 months, but the benefit was no longer statistically significant, perhaps due to data loss.

Citations

1 Weaver LK, Hopkins RO, Chan KJ et al. Hyperbaric oxygen for acute carbon monoxide poisoning. *N Engl J Med* 347; 14: 1057-1066
2 Weaver LK, Hopkins RO, Larson-Lohr V et al. Double-blind, controlled, prospective, randomized clinical trial (RCT) in patients with acute carbon monoxide (CO) poisoning: outcome of patients treated with normobaric oxygen or hyperbaric oxygen (HBO2) – an interim report. *Undersea Hyperbar Med* 1995; **22** (Suppl): 14
3 Weaver LK, Hopkins RO, Larson-Lohr V et al. Double-blind, controlled, prospective, randomized clinical trial (RCT) in patients with acute carbon monoxide (CO) poisoning: outcome of patients treated with normobaric oxygen or hyperbaric oxygen (HBO2) – an interim report. *Proceedings International Joint Meeting on Hyperbaric and Underwater Medicine*, Marroni A, Oriani G, Wattel F eds. 1996: 333-334

Three-part clinical question

For patients with acute carbon monoxide poisoning, does hyperbaric oxygen therapy, compared to normobaric oxygen therapy, reduce the incidence of long-term cognitive sequelae?

Search terms

Hyperbaric oxygenation, carbon monoxide poisoning

The study: Double-blinded concealed randomised controlled trial with intention-to-treat.

The study patients: Non-moribund patients with a diagnosis of acute, symptomatic carbon monoxide poisoning.

Control group: (n = 76; 76 analysed) Normobaric oxygen therapy: 1st session: 100% O2 at 1ATA for total time of 150 mins. 2nd and 3rd sessions: air at 1 ATA for total time 120 mins.

Experimental group: (n = 76; 76 analysed) Hyperbaric oxygen therapy: 1st session: 100% O2 at 3 then 2 ATA. 2nd and 3rd sessions: 100% O2 at 2 ATA. Session times as above.

The evidence: See Table 1

Comments

1 This is a well conducted study of high methodological rigour.
2 Less than 80% follow up at 6 months (77%).
3 Main benefits were reported for memory and attention.
4 Data loss was dealt with by conservative assumptions as to the state of patients lost to follow up. These are the figures used above.

Analysis of the actual data by intention to treat suggests loss of statistical significance at 12 months (p = 0.08). The suggested benefit from HBOT at 6 and 12 months is sensitive to best case/worst case analysis for missing data. For example, at 12 months best case yields a significant benefit of HBOT (NNT 4, 95%CI 3 – 8), while worst case suggests no significant difference between the arms (NNH 15, 5 – inf). Thus, we have less confidence in the preservation of effect at 6 and 12 months, although there is a trend to benefit.

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TABLE 1
THE RELATIVE AND ABSOLUTE RISK REDUCTIONS AND NUMBERS NEEDED TO TREAT, FROM WEAVER ET AL

Outcome	Time to outcome	Normobaric group	Hyperbaric group	Relative risk reduction	Absolute risk reduction	Number need to treat
Cognitive sequelae	**6 weeks**	0 .461	0.250	46%	0.211	5
95% CI				14 to 78%	0.063 to 0.359	3 to 16
Cognitive sequelae	**6 months**	0.382	0.211	45%	0.171	6
95% CI				7 to 82%	0.028 to 0.314	3 to 35
Cognitive sequelae	**12 months**	0.329	0.184	44%	0.145	7
95% CI				2 to 86%	0.008 to 0.282	4 to 124