

**SOCIETA' ITALIANA  
DI  
MEDICINA SUBACQUEA E IPERBARICA**



**RICERCA IN MEDLINE DEI LAVORI DI  
OSSIGENO TERAPIA IPERBARICA  
INDICIZZATI CON PAROLA CHIAVE DI IMPORTANZA RILEVANTE**

**2005  
PRIMO SEMESTRE**

a cura del  
**Dott. Francesco Ruocco**  
Servizio di Medicina Iperbarica e Subacquea  
Anestesia e Rianimazione del Dipartimento di Emergenza  
della Azienda Ospedaliera Universitaria di Careggi

Search "**Hyperbaric Oxygenation**"[MAJR] Limits: **Publication Date from 2005/01 to 2005/06**

**Search "Hyperbaric Oxygenation"[MAJR] Limits: Publication Date from 2005/01 to 2005/06**

1: Int Marit Health. 2005;56(1-4):188-9.

International conference on diving and hyperbaric medicine. XV International Congress of Hyperbaric Medicine (ICHM) 31st Annual Meeting of the European Underwater and Baromedical Society (EUBS) Barcelona, Spain, 7-9 September 2005.

Kot J.

PMID: 16532598 [PubMed - indexed for MEDLINE]

2: J Basic Clin Physiol Pharmacol. 2005;16(4):275-85.

Hyperbaric oxygenation and antioxidant vitamin combination reduces ischemia-reperfusion injury in a rat epigastric island skin-flap model.

Tomur A, Etlik O, Gundogan NU. Department of Physiology, GATA Military Medical School Etlik, Ankara.

Reperfusion injury, caused by free oxygen radicals, is a chain of events that occurs in tissues exposed to a constant period of ischemia. The antioxidant vitamins E and C (VEC) and hyperbaric oxygenation (HBO) have beneficial effects in treating ischemic tissues following skin flap operations. In our study, we aimed to compare the effects of VEC and/or HBO in ischemia-reperfusion injury induced by free oxygen radicals in an experimental rat epigastric island skin-flap model. Eight hours of ischemia was provided by clamping the inferior epigastric pedicle following the flap elevation. The flap survey was determined to be 28.6% in controls, 59.2% in HBO group, 66.3% in VEC + HBO group, and 82% in VEC group ( $p < 0.05$ ). We conclude that although HBO and/or VEC increased the flap viability significantly by reducing ischemia-reperfusion injury, the most

promising results were obtained in the antioxidant vitamins group.

PMID: 16438393 [PubMed - indexed for MEDLINE]

3: Bull Acad Natl Med. 2005 May;189(5):853-64; discussion 864-5.

[Oxygen and wound healing]

[Article in French]

Wattel F, Mathieu D.

Service de Reanimation et de Medecine Hyperbare, Hopital Calmette, boulevard du Professeur Leclercq, C.H.R.U., 59037 Lille. f-wattel@chru-lille.fr

It has long been recognized that normal healing is dependent on the oxygen gradient in the wound Hypoxia can slow or arrest the healing process and augments the risk of infection. While hypoxia triggers neoangiogenesis, normal tissue oxygen pressures are mandatory for migration of repair cells (macrophages, fibroblasts), production of collagen precursors and, thus, for wound repair with good mechanical properties. Recent studies have identified the underlying molecular mechanisms of wound repair. In clinical practice, hyperbaric oxygen therapy is to treat problem wounds like diabetic foot lesions, arterial ulcers, and radionecrosis. Direct or indirect measurement of oxygen tissue pressure can help to select patients and to monitor treatment outcome.

Publication Types: Review

PMID: 16433457 [PubMed - indexed for MEDLINE]

4: Toxicol Rev. 2005;24(3):157-8; discussion 159-60.

Comment in: Toxicol Rev. 2005;24(3):145-7.

Comment on: Toxicol Rev. 2005;24(2):75-92.

Hyperbaric oxygen therapy for carbon monoxide poisoning : is it time to end the debates?

Thom SR.

Publication Types: Comment Editorial

PMID: 16390215 [PubMed - indexed for MEDLINE]

5: Toxicol Rev. 2005;24(3):155-6; discussion 159-60.

Comment in: Toxicol Rev. 2005;24(3):145-7.

Comment on: Toxicol Rev. 2005;24(2):75-92.  
The myth.  
Seger D.  
Publication Types: Comment  
Editorial  
PMID: 16390214 [PubMed - indexed for  
MEDLINE]

6: Toxicol Rev. 2005;24(3):153-4;  
discussion 159-60.  
Comment on: Toxicol Rev. 2005;24(2):75-92.  
Hyperbaric oxygen for carbon  
monoxide poisoning.  
Bentur Y.  
Publication Types: Comment  
Editorial  
PMID: 16390213 [PubMed - indexed for  
MEDLINE]

7: Toxicol Rev. 2005;24(3):151;  
discussion 159-60.  
Comment in: Toxicol Rev. 2005;24(3):145-7.  
Comment on: Toxicol Rev. 2005;24(2):75-92.  
Hyperbaric oxygen or normobaric  
oxygen?  
Olson KR.  
Publication Types: Comment  
Editorial  
PMID: 16390212 [PubMed - indexed for  
MEDLINE]

8: Toxicol Rev. 2005;24(3):149-50;  
discussion 159-60.  
Comment in: Toxicol Rev. 2005;24(3):145-7.  
Comment on: Toxicol Rev. 2005;24(2):75-92.  
Hyperbaric therapy for carbon  
monoxide poisoning : to treat or not  
to treat, that is the question.  
Henry JA.  
Publication Types: Comment  
Editorial  
PMID: 16390211 [PubMed - indexed for  
MEDLINE]

9: Toxicol Rev. 2005;24(3):145-7.  
Comment on: Toxicol Rev. 2005;24(2):75-92. Toxicol Rev. 2005;24(3):149-50; discussion 159-60. Toxicol Rev. 2005;24(3):151; discussion 159-60. Toxicol Rev. 2005;24(3):155-6; discussion 159-60. Toxicol Rev. 2005;24(3):157-8; discussion 159-60.  
What does the present state of  
knowledge tell us about the  
potential role of hyperbaric oxygen

therapy for the treatment of carbon  
monoxide poisoning?  
Brent J.  
Publication Types: Comment  
Editorial  
PMID: 16390210 [PubMed - indexed for  
MEDLINE]

10: Stomatologia (Mosk). 2005;84(6):33-4.  
[Kuttner's inflammatory tumor  
(sialadenosis of submandibular  
salivary glands). Case report]  
[Article in Russian]  
Afanas'ev VV, Nosenko NV.  
A clinical case of a observation  
over the patient with Kuttner's  
inflammatory tumor is described.  
Quick and complete curative effect  
was achieved after the use of one  
course of hyperbaric oxygenotherapy.  
Publication Types: Case Reports  
PMID: 16353033 [PubMed - indexed for  
MEDLINE]

11: Med Tr Prom Ekol. 2005;(9):4-9.  
[Justifying hyperbaric oxygenation  
use for medical correction in  
individuals working in extreme  
conditions]  
[Article in Russian]  
Sedov AV, Vorob'ev GF, Engel'gardt  
GN.  
Experimental studies were conducted  
to justify possibility of hyperbaric  
oxygenation to correct functional  
state in individuals working in  
extreme conditions. Studies were  
aimed to determine stress resistance  
in apparently healthy individuals,  
to choose hyperbaric oxygenation  
method and mode.  
PMID: 16281362 [PubMed - indexed for  
MEDLINE]

12: Cerebrovasc Dis. 2005;20(6):417-  
26. Epub 2005 Oct 17.  
Hyperbaric oxygen therapy of  
cerebral ischemia.  
Helms AK, Whelan HT, Torbey MT.  
Medical College of Wisconsin,  
Milwaukee, Wisc. 53226, USA.  
BACKGROUND: Hyperbaric oxygen (HBO)  
therapy of cerebral ischemia has  
been evaluated in a number of human  
and animal studies; however, there  
is presently no consensus on its  
efficacy. METHODS: We present a  
review of animal and human studies  
on HBO therapy of cerebral ischemia  
as well as present potential  
mechanisms of action of HBO.  
RESULTS: Animal studies of HBO have

shown promise by reducing infarct size and improving neurologic outcome. HBO has also been shown to inhibit inflammation and apoptosis after cerebral ischemia. Early reports in humans also suggested benefit in stroke patients treated with HBO. Recent randomized, controlled human studies, however, have not shown benefit, although all were limited by small sample size. Important differences between animal and human studies suggest HBO might be more effective in stroke within the first few hours and at a pressure of 2-3 ATA. CONCLUSIONS: The clinical usefulness of HBO in the treatment of cerebral ischemia is not yet certain. Attention to emerging pathophysiologic data should be taken into consideration in design of any future clinical trials of HBO in acute ischemic stroke. 2005 S. Karger AG, Basel  
Publication Types: Review  
PMID: 16230845 [PubMed - indexed for MEDLINE]

13: Przegł Lek. 2005;62(6):436-7.  
Oxygen therapy for CO poisoning: rationale and recommendations.  
Mathieu D, Mathieu-Nolf M.  
Service d'urgences respiratoires de Reanimation medicale et de medecine Hyperbare, Centre Hospitalier Universitaire de Lille, Lille, France.  
CO poisoning remains a serious public health problem. Oxygen is the basis of its treatment and HBO has been proven more effective to prevent cognitive sequelae than NBO. Most commonly accepted criteria for HBO treatment are: comatose patient, loss of consciousness, neuropsychological and cardiac symptoms and pregnancy. However, patients not requiring HBO, have to be treated by a correct NBO regimen.  
Publication Types: Review  
PMID: 16225089 [PubMed - indexed for MEDLINE]

14: Toxicol Rev. 2005;24(2):75-92.  
Comment in: Toxicol Rev. 2005;24(2):73.  
Toxicol Rev. 2005;24(3):145-7.  
Toxicol Rev. 2005;24(3):149-50; discussion 159-60.  
Toxicol Rev. 2005;24(3):151; discussion 159-60.  
Toxicol Rev. 2005;24(3):153-4; discussion 159-60.  
Toxicol Rev. 2005;24(3):155-6;

discussion 159-60. Toxicol Rev. 2005;24(3):157-8; discussion 159-60.  
Hyperbaric oxygen for carbon monoxide poisoning : a systematic review and critical analysis of the evidence.  
Buckley NA, Isbister GK, Stokes B, Juurlink DN.  
Department of Clinical Pharmacology and Toxicology, Australian National University Medical School, Canberra, Australian Capital Territory.  
Poisoning with carbon monoxide (CO) is an important cause of unintentional and intentional injury worldwide. Hyperbaric oxygen (HBO) enhances CO elimination and has been postulated to reduce the incidence of neurological sequelae. These observations have led some clinicians to use HBO for selected patients with CO poisoning, although there is considerable variability in clinical practice. This article assesses the effectiveness of HBO compared with normobaric oxygen (NBO) for the prevention of neurological sequelae in patients with acute CO poisoning. The following databases were searched: MEDLINE (1966 to present), EMBASE (1980 to present), and the Controlled Trials Register of the Cochrane Collaboration, supplemented by a manual review of bibliographies of identified articles and discussion with recognised content experts. All randomised controlled trials involving people acutely poisoned with CO, regardless of severity, were examined. The primary analysis included all trials from which data could be extracted. Sensitivity analysis examined trials with better validity (defined using the validated instrument of Jadad) and those enrolling more severely poisoned patients. Two reviewers independently extracted from each trial, including information on the number of randomised patients, types of participants, the dose and duration of the intervention, and the prevalence of neurological sequelae at follow-up. A pooled odds ratio (OR) for the presence of neurological symptoms at 1-month follow-up was calculated using a random effects model. Bayesian models were also investigated to illustrate the degree of certainty about clinical effectiveness. Eight randomised controlled trials were

identified. Two had no evaluable data and were excluded. The remaining trials were of varying quality and two have been published only as abstracts. The severity of CO poisoning varied among trials. At 1-month follow-up after treatment, sequelae possibly related to CO poisoning were present in 242 of 761 patients (36.1%) treated with NBO, compared with 259 of 718 patients (31.8%) treated with HBO. Restricting the analysis to the trials with the highest quality scores or those that enrolled all patients regardless of severity did not change the lack of statistical significance in the outcome of the pooled analysis. We found empiric evidence of multiple biases that operated to inflate the benefit of HBO in two positive trials. In contrast, the interpretation of negative trials was hampered by low rates of follow-up, unusual interventions for control patients and inclusion of less severely poisoned patients. Collectively, these limitations may have led negative trials to overlook a real and substantial benefit of HBO (type II error). There is conflicting evidence regarding the efficacy of HBO treatment for patients with CO poisoning. Methodological shortcomings are evident in all published trials, with empiric evidence of bias in some, particularly those that suggest a benefit of HBO. Bayesian analysis further illustrates the uncertainty about a meaningful clinical benefit. Consequently, firm guidelines regarding the use of HBO for patients with CO poisoning cannot be established. Further research is needed to better define the role of HBO, if any, in the treatment of CO poisoning. Such research should not exclude patients with severe poisoning, have a primary outcome that is clinically meaningful and have oversight from an independent data monitoring and ethics committee.

Publication Types: Review  
PMID: 16180928 [PubMed - indexed for MEDLINE]

15: Toxicol Rev. 2005;24(2):73.  
Comment on: Toxicol Rev. 2005;24(2):75-92.  
Editorial announcement.

Brent J, Vale A.  
Publication Types: Comment  
Editorial  
PMID: 16180927 [PubMed - indexed for MEDLINE]

16: Neurocrit Care. 2005;2(2):206-11.

Delayed and multiple hyperbaric oxygen treatments expand therapeutic window in rat focal cerebral ischemic model.

Yin D, Zhang JH.  
Department of Neurosurgery,  
University of Mississippi Medical  
Center, Jackson, MS, USA.

Although the brain-protective effect of single, early applications of hyperbaric oxygen (HBO) has been reported in acute ischemic stroke models, few studies have reported the long-term effect--especially after multiple HBO applications. This study employed delayed, multiple HBO treatments and evaluated cerebral infarction and neurological functional recovery for 4 weeks after transient focal ischemia. Adult male Sprague-Dawley rats were subjected to middle cerebral artery occlusion/reperfusion (MCAO/R) and were subsequently exposed to HBO (2.5 atmospheres absolute [ATA]) for 2 hours per day. HBO was administered at either 6 or 24 hours after MCAO/R and was repeated daily for 6 days. Rat behavior was scored to evaluate neurological deficits. The brains were removed for histological analysis of the infarct ratio at 1 and 4 weeks. Rats with HBO delayed for 6 or 24 hours following MCAO/R displayed a significant decrease of infarct ratio and amelioration of neurological deficits compared to the untreated group. This study suggests that delayed, but multiple, HBO treatments can improve neurological evaluation and reduce cerebral infarction.

PMID: 16159067 [PubMed - indexed for MEDLINE]

17: Sports Med. 2005;35(9):739-46.  
Hyperbaric oxygen as an adjuvant for athletes.

Ishii Y, Deie M, Adachi N, Yasunaga Y, Sharman P, Miyayama Y, Ochi M.  
Department of Orthopaedic Surgery,  
Hiroshima University, Hiroshima,  
Japan. yoishii@hiroshima-u.ac.jp

There has recently been a resurgence in interest in hyperbaric oxygen (HBO) treatment in sports therapy, especially in Japan. Oxygen naturally plays a crucial role in recovery from injury and physiological fatigue. By performing HBO treatment, more oxygen is dissolved in the plasma of the pulmonary vein via the alveolar, increasing the oxygen reaching the peripheral tissues. HBO treatment is therefore expected to improve recovery from injury and fatigue. HBO treatment has been reported to reduce post-injury swelling in animals, and in humans; swelling was also mitigated, but to a lesser extent. Positive results have also been reported regarding tissue remodelling after injury, with injuries involving bones, muscles and ligaments showing improved recovery. Furthermore, HBO treatment has effectively increased recovery from fatigue. This was clearly seen at the Nagano Winter Olympics, where sports players experiencing fatigue were successfully treated, enabling the players to continue performing in the games. Despite its potential, HBO treatment does have its risks. Increasing oxygen levels in tissues poses a risk to DNA through oxidative damage, which can lead to pathological changes in the CNS and the lungs. Regarding the operating of HBO systems, safer administration should be advised. Further research into HBO treatment is required if this therapy is to become more widespread. It should become possible to tailor treatment to an individual's condition in order to use HBO treatment efficiently.

Publication Types: Review  
PMID: 16138784 [PubMed - indexed for MEDLINE]

18: Undersea Hyperb Med. 2005 May-Jun;32(3):145-7.  
Hyperbaric oxygen therapy for radiation necrosis of the jaw: comments on a randomized study.  
Moon RE, McGraw TA, Blakey G 3rd.  
Publication Types: Letter  
PMID: 16119305 [PubMed - indexed for MEDLINE]

19: Undersea Hyperb Med. 2005 May-Jun;32(3):141-3.  
Erratum in: Undersea Hyperb Med. 2005 Jul-Aug;32(4):185. Hampson,

Neil B [added]; Bennett, Michael [added].

In response to the negative randomized controlled hyperbaric trial by Annane et al in the treatment of mandibular ORN.  
Feldmeier JJ, Hampson NB, Bennett M.  
Publication Types: Letter  
PMID: 16119304 [PubMed - indexed for MEDLINE]

20: Anesteziol Reanimatol. 2005 May-Jun;3(3):53-7.  
[The mechanism of neuroprotective action of clonidine]  
[Article in Russian]  
Karmen NB.  
Publication Types: Clinical Trial  
PMID: 16076049 [PubMed - indexed for MEDLINE]

21: Surg Today. 2005;35(8):653-61.  
The effect of hyperbaric oxygen treatment on the renal functions in septic rats: relation to oxidative damage.  
Edremitlioglu M, Kilic D, Oter S, Kisa U, Korkmaz A, Coskun O, Bedir O.  
Department of Physiology, Kirikkale University School of Medicine, 71100 Kirikkale, Turkey.  
PURPOSE: To investigate the effects of hyperbaric oxygen (HBO) treatment on renal functions and damage in septic rats. METHODS: The animals were divided into four groups, each containing ten animals: control, hyperbaric oxygen, sepsis, and sepsis/hyperbaric oxygen. One milliliter of saline containing live Escherichia coli cells ( $2.1 \times 10^9$ ) was injected intraperitoneally to induce sepsis. The groups treated with HBO were given five sessions of 2 atmospheres absolute of 100% oxygen at intervals of 6 h. Blood, urine, and tissue samples were then collected, and the functional renal parameters, malondialdehyde (MDA) levels, and superoxide dismutase (SOD) and catalase activities were examined. RESULTS: The reduced glomerular filtration rate and urine flow returned to normal levels after HBO treatment; however, the increase in fractionated sodium excretion continued. The increased MDA levels in the renal cortex and medulla also decreased to the level of the control group. In the sepsis group, both the SOD and catalase activities

decreased in the renal cortex, while a reduction was observed only in the catalase activity in the medulla. The reduced enzyme activities significantly increased in the sepsis/hyperbaric oxygen group. CONCLUSION: HBO treatment has a beneficial effect on renal dysfunction in sepsis. The probable reason for this effect is the reduction in oxidative damage because of the increase in antioxidative capacity. PMID: 16034546 [PubMed - indexed for MEDLINE]

22: Am Surg. 2005 Feb;71(2):144-51. Adjuvant hyperbaric oxygen therapy in the management of crush injury and traumatic ischemia: an evidence-based approach. Garcia-Covarrubias L, McSwain NE Jr, Van Meter K, Bell RM. Department of Surgery, Tulane University School of Medicine and Charity Hospital, New Orleans, Louisiana 70112, USA. Hyperbaric oxygen therapy (HBO) has been recommended as an adjunct treatment in acute traumatic ischemia and crush injury. Several animal models have shown better outcomes when HBO is used in crush injury and compartment syndrome. Animal and in vitro models have suggested that these beneficial effects may be mediated by attenuation of ischemia-reperfusion injury. We did a systematic review of the literature using the Eastern Association for the Surgery of Trauma (EAST) recommendations for evidence-based reviews. An electronic search using Medline, OVID technologies, and the Cochrane database was performed. Only clinical papers published between 1966 and December 2003 with at least five patients that included enough information to evaluate were selected. A group of trauma experts reviewed the selected articles and scored them applying the instrument developed by the EAST practice management guidelines committee. Nine documents fulfilled the inclusion criteria for a total of approximately 150 patients. Most documents were retrospective, uncontrolled, and case series lacking a standardized methodology (class III). There was one prospective controlled randomized

trial with some limitations on its design. We determined that eight of nine studies showed a beneficial effect from HBO with only one major complication. We concluded that adjunctive HBO is not likely to be harmful and could be beneficial if administered early. Well designed clinical studies are warranted. Publication Types: Meta-Analysis Review PMID: 16022014 [PubMed - indexed for MEDLINE]

23: J Trauma. 2005 Jun;58(6):1230-5. Early administration of hyperbaric oxygen therapy in distraction osteogenesis--a quantitative study in New Zealand rabbits. Wang IC, Wen-Neng Ueng S, Yuan LJ, Tu YK, Lin SS, Wang CR, Tai CL, Wang KC. Department of Orthopaedic Surgery, Chang Gung Memorial Hospital, Chang Gung University, Taiwan. BACKGROUND: We investigated the effect of hyperbaric oxygen (HBO) therapy on the early phase of tibial lengthening in our established rabbit model. METHODS: Twenty-four male rabbits (six per group) underwent right tibial lengthening by 5 mm. Group 1 then underwent 2.5 atmospheres of absolute hyperbaric oxygenation for 2 hours daily for 6 weeks postoperatively; group 2, for early 5 weeks (weeks 1-5), group 3, for late 5 weeks (weeks 2-6), and group 4 had no HBO therapy. Bone mineral density (BMD) was measured before surgery and weekly thereafter from weeks 2 through 6. The mechanical strengths of the lengthened tibias were measured. RESULTS: Significantly higher mean %BMDs were obtained for groups 1 and 2 compared with groups 3 and 4. There was no difference in the mean %BMD between groups 1 and 2 ( $p > 0.05$ ). The results were similar for mean percentage maximal torque; group 1 had the maximum torque, followed sequentially by groups 2 through 4. CONCLUSION: The study results suggest that early and full-term administration of HBO therapy on tibial lengthening may achieve better benefits. PMID: 15995475 [PubMed - indexed for MEDLINE]

24: Zh Nevrol Psikhiatr Im S S Korsakova. 2005;(Suppl 13):25-9.

[The normoxic therapeutic compression effect on microcirculation in acute stroke]

[Article in Russian]

Kazantseva NV, Volkova NA, Makarova LD, Petukhov EB, Berezov VP.

The study evaluates efficacy of two hyperbaric therapeutic regimes--1,-51,1 atm and 1,2 atm in patients with an acute ischemic stroke. Acid-base equilibrium dynamics of capillary and venous blood, whole blood and plasma, platelet aggregation and lipid peroxidation were investigated. An analysis of the data revealed that, comparing to the conventional method, barotherapy in stroke is accompanied by a marked therapeutic effect. Barotherapy or normoxic therapeutic compression is principally different from other methods of oxygen therapy, because it is not resultant in blood plasma hyperoxygenation and in lipid peroxidation augmenting. Activation of tissue respiration in barotherapy accompanied by normalization of lipid peroxidation process and CO2 resources restoration leads to renewal of MKT microcirculation and autoregulation, thus providing a stable therapeutic effect of the method in brain ischemia.

Publication Types: Clinical Trial

PMID: 15986823 [PubMed - indexed for MEDLINE]

25: J UOEH. 2005 Jun 1;27(2):219-21.

[A report from the European Clinical Trials Group--new cancer treatment: hyperbaric oxygen may be approved for insurance adaptation]

[Article in Japanese]

Kohshi K.

PMID: 15986777 [PubMed - indexed for MEDLINE]

26: Zh Nevrol Psikhiatr Im S S Korsakova. 2005;105(6):26-30.

[Normoxic curative compression in combined treatment of hypertensive encephalopathy]

[Article in Russian]

Kazantseva NV, Volkova NA, Buklina SB.

PMID: 15984184 [PubMed - indexed for MEDLINE]

27: Nippon Ronen Igakkai Zasshi. 2005 May;42(3):360-3.

[A case of interval form of carbon monoxide poisoning with a remarkable recovery]

[Article in Japanese]

Taguchi Y, Takashima S, Inoue H.

Second Department of Internal Medicine, Toyama Medical and Pharmaceutical University.

A 69-year-old woman was admitted to our hospital due to an interval form of carbon monoxide (CO) poisoning one month after acute CO poisoning. On admission, she had disorientation, memory disturbance, apathy, masked face, muscle rigidity, bradykinesia and parkinsonian gait. An MRI (FLAIR image) revealed high signal intensity lesions in the bilateral globus pallidus and the white matter of the frontal lobe. Hyperbaric oxygen (HBO) therapy at 2 atmospheres for 60 min was given every day, in addition to citicoline, levodopa/DCI and selegiline hydrochloride. Cognitive disturbance and parkinsonism gradually decreased, and abnormal signals in the bilateral globus pallidus and the cerebral white matter were attenuated after the treatment. Neuropsychiatric abnormalities except for a slight gait disturbance disappeared one and a half month after starting the treatment. In addition to HBO therapy, administration of citicoline, lovodopa and selegiline may be useful in the case of the interval form of CO poisoning.

Publication Types: Case Reports  
PMID: 15981666 [PubMed - indexed for MEDLINE]

28: Eur J Neurosci. 2005 Jun;21(11):3189-94.

Reduced infarct volume and differential effects on glial cell activation after hyperbaric oxygen treatment in rat permanent focal cerebral ischaemia.

Gunther A, Kupperts-Tiedt L, Schneider PM, Kunert I, Berrouschot J, Schneider D, Rossner S.

Department of Neurology, University of Leipzig, Liebigstrasse 22a, 04103 Leipzig, Germany. guea@medizin.uni-leipzig.de

Permanent middle cerebral artery occlusion (MCAO) causes neurodegeneration and a robust activation of glial cells primarily in sensorimotor brain regions of

rats. It has been shown that hyperbaric oxygen (HBO) increases oxygen supply to ischaemic areas and reduces neuronal cell loss. The effects of HBO treatment on microgliosis and astrogliosis in permanent cerebral ischaemia have not been addressed so far, but might be critical for neurodegeneration and neuroprotection, respectively. Therefore, we used spontaneously hypertensive rats with permanent MCAO to investigate the time window to start HBO and to compare the effects of different HBO treatment frequencies on infarct volume and on differences with regard to microgliosis and astrogliosis. Seven days after MCAO the infarct volume was calculated from Nissl-stained brain sections by image analysis. HBO significantly decreased the infarct volume when used as early as 15, 90 or 180 min post-MCAO by 24%, 16% and 13%, respectively, in the single-treatment group. Repetitive HBO treatment (first HBO session 90 min after MCAO) was not effective. Microglial cells and astrocytes were detected by cytochemical fluorescent labelling and confocal laser scanning microscopy. In the single-treatment group we observed significantly higher astrocyte immunoreactivity but decreased microglial density in the peri-infarct region. These effects of HBO treatment on glial cells were not present in rats where HBO did not reduce the infarct volume (360 min after MCAO). Our data indicate that HBO-induced suppression of microgliosis and aggravated response of astrocytes might contribute to the reported beneficial effects of early HBO treatment in cerebral ischaemia.

PMID: 15978027 [PubMed - indexed for MEDLINE]

29: Br J Oral Maxillofac Surg. 2005 Dec;43(6):538-9. Epub 2005 Jun 15.

Comment on: J Clin Oncol. 2004 Dec 15;22(24):4893-900.

Does the Annane paper (2004) signal the end of HBO for ORN?

Rogers SN.

Publication Types: Comment Letter

PMID: 15963609 [PubMed - indexed for MEDLINE]

30: Epilepsia. 2005 Jun;46(6):974-6.

Partial seizure provoked by hyperbaric oxygen therapy: possible mechanisms and implications.

Doherty MJ, Hampson NB.

Swedish Epilepsy Center, Virginia Mason Medical Center, Seattle, Washington 98122, USA.

michael.doherty@swedish.org

Hyperbaric oxygen treatment (HBO2) is used commonly for treatment of bone and soft-tissue radiation necrosis. It may be a potential therapy for radiation necrosis seen after brain irradiation. HBO2 risks include generalized tonic-clonic convulsions. We report a patient after resection of anaplastic astrocytoma and 5,580 cGy of total external-beam radiation treatments with brain radiation necrosis who underwent HBO2 therapy and developed a partial seizure during treatment. Mechanisms and implications are discussed.

Publication Types: Case Reports  
PMID: 15946345 [PubMed - indexed for MEDLINE]

31: Anasthesiol Intensivmed Notfallmed Schmerzther. 2005 Jun;40(6):354-7.

[Routine use of high inspired oxygen concentration -- con]

[Article in German]

Suttner S, Boldt J.

Klinik für Anästhesie und Operative Intensivmedizin, Klinikum der Stadt Ludwigshafen. suttner@gmx.de

PMID: 15942855 [PubMed - indexed for MEDLINE]

32: Anasthesiol Intensivmed Notfallmed Schmerzther. 2005 Jun;40(6):350-3.

[Routine use of high inspired oxygen concentration -- pro]

[Article in German]

Danzeisen O, Priebe HJ.

Anästhesiologische Universitätsklinik Freiburg.

PMID: 15942854 [PubMed - indexed for MEDLINE]

33: Undersea Hyperb Med. 2005 Mar-Apr;32(2):111-9.

Effect of age and repeated hyperbaric oxygen treatments on vagal tone.

Lund VE, Kentala E, Scheinin H, Lertola K, Klossner J, Aitasalo K, Sariola-Heinonen K, Jalonen J.

Dept. of Anesthesiology and Intensive Care, Turku University Hospital, Finland.

**OBJECTIVES:** To evaluate the influence of repeated hyperbaric oxygen (HBO<sub>2</sub>) exposures and age on vagal response to hyperbaric oxygenation, and to evaluate the timing of changes in vagal activity during the treatments. **STUDY DESIGN:** Open, controlled, non-randomized study. **METHODS:** Heart rate variability of 23 patients with chronic osteomyelitis or radionecrosis of the jaw or reconstructive surgery of the facial region was studied during repeated treatments. During each treatment, the patients were exposed to HBO<sub>2</sub> at 2.5 ATA and heart rate variability was measured using power spectral analysis before compression, three times at 2.5 ATA and during and after decompression. The patients were grouped according to age (Cut-off point 50 years). Statistical analysis was carried out using analysis of variance for repeated measurements. **RESULTS:** Repeated exposures did not change vagal response to hyperbaric oxygenation. Vagal activity measured by HF power increased significantly in both age groups during the HBO<sub>2</sub> exposures but there were no significant difference between the groups in the response. However, the level of HF power was significantly higher in the subjects under 50 years old. Significant differences between consecutive measurements were related to pressure changes. **CONCLUSIONS:** Repeated therapeutic HBO<sub>2</sub> exposures are not causing permanent changes in vagal control of the heart. Vagal responsiveness to hyperbaric hyperoxia is preserved in advanced age.

Publication Types: Clinical Trial  
Controlled Clinical Trial  
PMID: 15926303 [PubMed - indexed for MEDLINE]

34: Undersea Hyperb Med. 2005 Mar-Apr;32(2):103-10.

Hyperbaric oxygen therapy in the treatment of complications of irradiation in head and neck area. Narozny W, Sicko Z, Kot J, Stankiewicz C, Przewozny T, Kuczkowski J.  
ENT Department Medical University of Gdansk, Poland.

**BACKGROUND AND PURPOSE:** We have investigated the treatment results of hyperbaric oxygen (HBO<sub>2</sub>) to patients with radiation-induced tissue complications. **MATERIAL AND METHODS:** Eight patients (1.4%) from 548 with head and neck cancers treated surgically with post- or preoperative radiotherapy or radiotherapy alone in standard doses who developed postradiation complications (6 patients with laryngeal chondroradionecrosis, 1 patient with osteoradionecrosis of the temporal bone, and 1 patient with soft tissue radionecrosis) are presented. To evaluate radiation reactions occurring in the head and neck region, we used the Chandler grading system for classification of postradiation larynx injuries and SOMA/LENT score for classification of postradiation injuries of mucosa of upper aerodigestive tract. Grades I and II in those grading systems are expected side effects of radiation therapy, thus our cases were all in grades III and IV. The HBO<sub>2</sub> was performed after failure of the conventional treatment (antibiotics, steroids, topical therapy). The number of HBO<sub>2</sub> expositions was from 8 to 39 and the delay to therapy from 2 to 22 months. **RESULTS:** Symptoms resolved in all treated patients. Six patients with laryngeal chondroradionecrosis had no symptoms after therapy and in three of them after partial laryngectomy the decannulation was performed. In one patient with mucosal radionecrosis after total laryngectomy, the esophageal fistula was closed and in one patient with osteoradionecrosis of the temporal bone, wound debridement followed. **CONCLUSION:** The authors' experience supports the increasing clinical evidence that HBO<sub>2</sub> is an effective adjunct therapy for treatment of complications of irradiation in head and neck area. PMID: 15926302 [PubMed - indexed for MEDLINE]

35: Hawaii Med J. 2005 Apr;64(4):102-3.

Hyperbaric oxygen therapy: caveat doctor!  
Smerz RW.  
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In the right hands, hyperbaric oxygen therapy is a safe and legitimately employed treatment modality for some specific medical conditions. It is not a panacea. It is a prescriptive treatment which should be administered only under the direct supervision of a trained hyperbaric physician. Caveat doctor! PMID: 15921247 [PubMed - indexed for MEDLINE]

36: Brain Res. 2005 Jun 21;1047(2):131-6.

Effect of hyperbaric oxygenation on intracranial pressure elevation rate in rats during the early phase of severe traumatic brain injury.

Rogatsky GG, Kamenir Y, Mayevsky A. Faculty of Life Sciences, Bar-Ilan University, Ramat-Gan 52900, Israel. rogatsg@mail.biu.ac.il

Intracranial pressure (ICP) was monitored to evaluate the therapeutic effect of hyperbaric oxygen (HBO(2)) treatment following traumatic brain injury (TBI). This subject is controversial. The aim of our study was to determine whether HBO(2) treatment has a therapeutic effect on ICP dynamics and survival following severe fluid percussion brain injury (FPBI) in rats. Changes in ICP level were analyzed every 30 min during an 8-h monitoring period following trauma and at the end of experiment (20 h). The control (A) and experimental (B) groups consisted of 7 and 4 rats, respectively. Group B was subjected to 1.5 atmospheres absolute (ATA) 100% oxygen for 60 min beginning 2 h after FPBI. No significant differences in ICP were noted between groups A and B before and after HBO(2) treatment until 3.5 h after trauma. At 4 h, for the first time, the difference became significant ( $P = 0.025$ ;  $n = 11$ ) and remained significant ( $P < 0.05$ ) for all measurement points until end of monitoring, when mean ICP values reached  $37.17 \pm 14.25$  and  $20.25 \pm 2.63$  mm Hg in groups A and B, respectively. Linear approximation models showed different trends ( $b_1 = 3.80 \pm 0.23$ ;  $r(2) = 0.65$ ,  $P < 0.001$  and  $b_1 = 1.56 \pm 0.25$ ;  $r(2) = 0.77$ ,  $P < 0.001$ ) for groups A and B, respectively. Covariance analysis confirmed significant differences between slopes for groups A and B ( $F = 148.04$ ,  $P < 0.001$ ;  $df = 2, 177$ ),

i.e., a significant difference in mean rate of ICP elevation. By the end of the experiment, 3 out of 7 rats from group A had died, but none from group B. We conclude that the application of HBO(2) during the early phase of severe FPBI significantly diminished ICP elevation rate and decreased mortality level.

PMID: 15904900 [PubMed - indexed for MEDLINE]

37: Clin Toxicol (Phila). 2005;43(3):181-8.

Hyperbaric oxygen in the treatment of carbon monoxide poisoning.

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Carbon monoxide, a byproduct of incomplete hydrocarbon combustion, has been responsible for many accidental poisonings worldwide. The signs and symptoms of poisoning are diverse, ranging from headache, dizziness, and confusion to cardiac and neurological disturbances. Oxygen is the cornerstone of treatment, because it accelerates the dissociation of carbon monoxide from heme proteins. The role of hyperbaric oxygen in the treatment of CO poisoning is still questionable. Only a few randomized, controlled studies have been conducted, and their results are inconsistent. In the present review, we discuss the conclusions of four randomized controlled studies and propose a hyperbaric oxygen treatment protocol based on these conclusions.

Publication Types: Review

PMID: 15902792 [PubMed - indexed for MEDLINE]

38: Arch Toxicol. 2005 May;79(5):289-93. Epub 2004 Nov 9.

Investigation of the role of hyperbaric oxygen therapy in cisplatin-induced nephrotoxicity in rats.

Atasoyu EM, Yildiz S, Bilgi O, Cermik H, Evrenkaya R, Aktas S, Gultepe M, Kandemir EG.

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Cisplatin (CP) is an effective chemotherapeutic agent used in the treatment of a variety of solid tumours. The most frequently observed side-effect of the use of CP is nephrotoxicity. Recently, evidence has been demonstrated that reactive oxygen species forming in the tubular epithelium play an important role in CP-linked nephrotoxicity. The aim of the study was to observe the effect of hyperbaric oxygen (HBO) therapy on CP nephrotoxicity, a subject which has not been studied previously. Wistar rats were treated with CP (a single intraperitoneal (IP) dose of 0.6 mg/100 g) alone and in combination with HBO (60 min every day for seven days at 2.5 x atmospheric pressure). Effects of the treatment on renal function and histology were determined. In analyses at the end of the study it was observed that serum urea, creatinine, and daily urinary protein excretion levels of the CP group were higher than at the start of the study, and that the creatinine clearance level had fallen ( $P < 0.05$ ). There was no significant difference between the CP+HBO group and HBO group serum urea, creatinine, creatinine clearance, and daily urinary protein excretion levels at the beginning and end of the study ( $P > 0.05$ ). Histopathological examination showed that the necrosis score in the proximal tubule epithelial cells and average apoptotic cell numbers in the CP group were higher than those in the CP+HBO and HBO groups ( $P < 0.05$ ). There was no statistical difference between the CP+HBO group and the HBO group in terms of necrosis score in the proximal tubule epithelial cells and the percentage of distal tubules containing hyaline casts in the lumen. In conclusion, in this study it was observed that in experimental study of CP nephrotoxicity the synchronous application of HBO therapy with CP prevents kidney damage.  
PMID: 15902426 [PubMed - indexed for MEDLINE]

39: Br J Oral Maxillofac Surg. 2005 Jun;43(3):219-25.

Survey of the use of hyperbaric oxygen by maxillofacial oncologists in the UK.

Kanatas AN, Lowe D, Harrison J, Rogers SN.  
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Oral and maxillofacial surgeons often use hyperbaric oxygen (HBO). Our aim was to find out the referral pattern of these surgeons for HBO. We contacted oral and maxillofacial units in England, Wales, and Scotland and identified 125 consultants who are involved in the management of patients with cancers of the head and neck. We sent these surgeons a postal questionnaire and 91 (73%) replied. Eighty-five of these consultants (93%) saw patients with osteoradionecrosis and only five of these never referred patients for HBO. About half the respondents (57%) saw patients for the insertion of osseointegrated implants after radiotherapy to the jaw, and seven of these never referred patients for HBO. All the respondents saw patients who required mandibular molar extractions after radiotherapy and 30 (33%) never referred these patients for HBO. Most consultants were unaware of the method of delivery of HBO. This survey suggests that most surgeons consider HBO to be part of the management of osteoradionecrosis, but their knowledge about delivery is weak and protocols vary.

PMID: 15888357 [PubMed - indexed for MEDLINE]

40: Acta Cir Bras. 2005 Mar-Apr;20(2):152-8.

[Comparative study of the hyperbaric hyperoxygenation in ischemic colonic loops in rats]

[Article in Portuguese]

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PURPOSE: To analyze and to evaluate the effect of the hyperbaric hyperoxygenation in the mechanical resistance of ischemic colon of rats. METHODS: Eighty rats, distributed in four groups of 20 animals in each one, were used. In

group 1 (G1), the control group, ischemia was not caused. Group 2 was submitted to the lesser degree of ischemia. Group 3 was submitted to the intermediate degree of ischemia. In group 4, a bigger degree of intestinal ischemia was provoked. Each group was divided in two sub-groups often animals each: with hyperbaric chamber (CC) and without hyperbaric chamber (SC). The animals of the four CC subgroups were placed in an experimental hyperbaric chamber in order to inhale oxygen at 100%, at two Absolute Atmospheres, for 120 minutes, for a four-day consecutive period. The animals of the four SC subgroups were kept in environment air during the five days of the experiment. All animals have been submitted to the mechanical study of the intestinal loop by the pressure test of the rupture by liquid distension. The euthanasia occurred in the fifth post-operative day. RESULTS: Considering the ischemia factor, the four groups were different among them ( $p=0.0001$ ). There was no statistical difference between subgroups CC and SC ( $p=0.3461$ ). CONCLUSION: The hyperbaric oxygen-therapy did not present improvement on the induced ischemia in rats upright colic loop. PMID: 15884716 [PubMed - indexed for MEDLINE]

41: J Urol. 2005 Jun;173(6):1975-7. Hyperbaric oxygen for the treatment of fournier's gangrene.

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PURPOSE: Fournier's gangrene is a necrotizing fasciitis of the genitalia that is associated with high morbidity and mortality. Groups at many institutions have initiated routine adjuvant hyperbaric oxygen (HBO) therapy. We examined whether HBO has made a difference in the morbidity, mortality and costs associated with treating this disease. We also analyzed predictors of extended hospital stay and mortality. MATERIALS AND METHODS: The records of patients with the hospital discharge diagnoses of Fournier's gangrene, necrotizing fasciitis, gangrene of the genitalia and scrotal gangrene from 1993 to 2002 were reviewed. Data concerning

clinical presentation characteristics, hospital stay, complications, hospital charges and outcomes, including graft failure and death, were analyzed. RESULTS: A total of 42 patients were identified and followed a median 4.2 years. Of the patients 16 underwent surgical debridement and antibiotic therapy alone, and 26 were treated with HBO plus surgery and antibiotics. Overall disease specific mortality was 21.4%, that is 12.5% in the nonHBO group and 26.9% in the HBO group. Three or more complications occurred in 13% of nonHBO and in 19% of HBO cases, of which the most common was myocardial infarction. The skin graft failure rate was 6% (nonHBO) and 8% (HBO). Physical disability was a statistically significant predictor of extended hospital stay ( $p < 0.01$ ). There was a trend toward a correlation between known coronary artery disease and death ( $p = 0.2$ ). A statistically significant difference was noted in average daily hospital charges in nonHBO vs HBO cases (\$2,552 vs \$3,384 daily,  $p < 0.01$ ). CONCLUSIONS: These data do not support routine HBO in the treatment of Fournier's gangrene. There was a trend toward higher morbidity and mortality in the HBO group, suggesting that treatment may have been given to patients who were more ill.

PMID: 15879795 [PubMed - indexed for MEDLINE]

42: Ulus Travma Acil Cerrahi Derg. 2005 Apr;11(2):172-7.

Adjunctive hyperbaric oxygen therapy contributes healing in electrical injury: a case report of high voltage electrical injury.

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In electrical injuries, new treatment modalities and guidelines are needed for improving clinical outcome and the survival of damaged tissue. Although there is no published study about hyperbaric oxygen (HBO) therapy for electrical injury in the literature, it is indicated in conditions, which may contribute to the clinical presentation of electrical injury

such as thermal burns, crush injuries, necrotizing soft tissue infections, problematic wounds and compromised skin grafts and flaps. An 11-year-old child with high voltage electrical injury treated with adjunctive hyperbaric oxygen for 90 minutes twice a day at 2,4 ATA for one week, then once a day for six days for a total of 20 sessions was presented to demonstrate the beneficial effects of hyperbaric oxygen therapy initiated before irreversible damage had taken place. Although hyperbaric oxygen therapy was initiated rather late, when the most effective window for intervention had already past, HBO was effective in fighting against necrosis, infection and tissue loss. Adjunctive HBO therapy is suggested for electrical injuries for its contribution to healing. In order to see the favourable effects of HBO, it is better to start the treatment within the first 24 hours following injury.

Publication Types: Case Reports  
PMID: 15877252 [PubMed - indexed for MEDLINE]

43: Childs Nerv Syst. 2006 Jan;22(1):38-42. Epub 2005 May 5. Hyperbaric oxygen therapy for the treatment of brain abscess in children.

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INTRODUCTION: The treatment of brain abscess remains a challenging topic usually involving a multimodal concept. METHODS: We report our experience with hyperbaric oxygen (HBO) therapy in five children presenting with brain abscesses between 1995 and 2002 at the Department of Neurosurgery, Graz. Mean age was 14.8 (range 11-17 years). All abscesses were located supratentorially. One child had a single abscess and one had multilocated abscesses. Two other patients presented with both subdural empyema and brain abscess, one of them showing an epidural empyema as well. In another child, the brain abscess was associated with meningoencephalitis and subdural empyema. In all of them the underlying condition was spread of

infection from the paranasal sinuses, except for one, who was immunocompromised due to cytotoxic chemotherapy for acute lymphocytic leukaemia. RESULTS: One single brain abscess and one of the multiple abscesses were drained. All subdural/epidural empyemas were treated surgically. Antibiotics were administered intravenously for 13 to 22 days (mean 22 days). All patients underwent HBO therapy; the number of treatments ranged from 26 to 45 "dives" (mean 30). Treatments were given once daily at 2.2 atmosphere absolutes for 60 min at 12 m. During the hospital stay all improved their clinical condition, with continued regression of abnormalities on magnetic resonance imaging (MRI). In the following weeks, other interventions were performed to treat the origin of the infections. At 6 months follow-up they were all in good clinical condition, either symptom free or with minor residual symptoms. MRI at this time showed no evidence of disease in three, a residual dural enhancement in one and a residual shrunken collection in the child with multilocated abscesses. No recurrence was observed during a mean follow-up of 21 months (range from 7 to 72 months). CONCLUSION: HBO therapy in children with brain abscesses seems to be safe and effective, even when they are associated with subdural or epidural empyemas. It provides a helpful adjuvant tool in the usual multimodal treatment of cerebral infections and may reduce the intravenous course of antibiotics and, consequently, the duration of hospitalization. Multidisciplinary management is recommended to optimize care for these critically ill children.

Publication Types: Clinical Trial

PMID: 15875200 [PubMed - indexed for MEDLINE]

44: Cochrane Database Syst Rev. 2005 Apr 18;(2):CD004818.

Hyperbaric oxygen therapy for acute coronary syndrome.

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**BACKGROUND:** Acute coronary syndrome (ACS) includes acute myocardial infarction and unstable angina. ACS is common and may prove fatal. Hyperbaric oxygen therapy (HBOT) will improve oxygen supply to the threatened heart and may reduce the volume of heart muscle that will perish. The addition of HBOT to the standard treatment may reduce death rate and other major adverse outcomes. **OBJECTIVES:** To assess the benefits and harms of adjunctive HBOT for treating ACS. **SEARCH STRATEGY:** We searched the following from inception to November 2004: CENTRAL, MEDLINE, EMBASE, CINAHL, DORCTHIM, and references from selected articles. Relevant journals were handsearched and researchers in the field contacted. **SELECTION CRITERIA:** Randomised studies comparing the effect on ACS of regimens that include HBOT with those that exclude HBOT. **DATA COLLECTION AND ANALYSIS:** Three reviewers independently evaluated the quality of trials using the guidelines of the Cochrane Handbook and extracted data from included trials. **MAIN RESULTS:** Four trials with 462 participants contributed to this review. There was a trend towards, but no significant decrease in, the risk of death with HBOT (relative risk (RR) 0.64, 95% CI 0.38 to 1.06, P=0.08). There was evidence from individual trials of reductions in the risk of major adverse coronary events [MACE] (RR 0.12, 95% CI 0.02 to 0.85, P=0.03; NNT 4, 95% CI 3 to 10) and some dysrhythmias following HBOT (RR 0.59, 95% CI 0.39 to 0.89, P=0.01; NNT 6, 95% CI 3 to 24), particularly complete heart block (RR 0.32, 95%CI 0.12 to 0.84, P=0.02), and that the time to relief of pain was reduced with HBOT (Weighted Mean Difference [WMD] 353 minutes shorter, 95% CI 219 to 488, P<0.0001). One trial suggested a significant incidence of claustrophobia in single occupancy chambers of 15% (RR of claustrophobia with HBOT 31.6, 95%CI 1.92 to 521, P=0.02). **AUTHORS' CONCLUSIONS:** For people with ACS, individual small trials suggest the addition of HBOT reduced the risk of Major Adverse Cardiac Events, some dysrhythmias, and reduced the time to relief from ischaemic pain, but did not reduce mortality. In view of

the modest number of patients, methodological shortcomings and poor reporting, this result should be interpreted cautiously, and an appropriately powered trial of high methodological rigour is justified to define those patients (if any) who can be expected to derive most benefit from HBOT. The routine application of HBOT to these patients cannot be justified from this review.

**Publication Types:** Meta-Analysis Review  
PMID: 15846734 [PubMed - indexed for MEDLINE]

45: Cochrane Database Syst Rev. 2005 Apr 18;(2):CD004617.

Hyperbaric oxygen as an adjuvant treatment for malignant otitis externa.

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**BACKGROUND:** Malignant, or necrotising, otitis externa is a potentially fatal infection of the external ear canal and surrounding soft tissue and bone. It may be complicated by involvement of cranial nerves, principally the facial nerves and the contents of the jugular foramen. It is an uncommon condition mainly found in the elderly or in diabetics.

**OBJECTIVES:** To assess the effectiveness of adjunctive hyperbaric oxygen treatment for malignant otitis externa. **SEARCH STRATEGY:** We searched the Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library Issue 4, 2003), MEDLINE (January 1966 to April 2004) and EMBASE (January 1985 to April 2004) with pre-specified terms. The date of the last search was 5th April 2004. **SELECTION CRITERIA:** Randomised controlled trials, involving adults, undergoing hyperbaric oxygen therapy in malignant otitis externa. **DATA COLLECTION AND ANALYSIS:** No identified articles described randomised controlled trials of hyperbaric oxygen therapy in the treatment of malignant otitis externa. **MAIN RESULTS:** Due to the lack of data no results could be presented. **AUTHORS' CONCLUSIONS:** No

clear evidence exists to demonstrate the efficacy of hyperbaric oxygen therapy when compared to treatment with antibiotics and/or surgery. No data were found to compare rates of complication between the different treatment modalities. Further research is required.

Publication Types: Review  
PMID: 15846724 [PubMed - indexed for MEDLINE]

46: Urology. 2005 Apr;65(4):649-53. Early hyperbaric oxygen therapy improves outcome for radiation-induced hemorrhagic cystitis.

Chong KT, Hampson NB, Corman JM. Section of Urology and Renal Transplantation, Virginia Mason Medical Center, Seattle, Washington 98111, USA.

OBJECTIVES: To assess the clinical factors that affect the efficacy of hyperbaric oxygen (HBO2) therapy in treating radiation-induced hemorrhagic cystitis. HBO2 therapy is an effective treatment for radiation-induced hemorrhagic cystitis, with reported response rates ranging from 76% to 100%. METHODS: The data from patients with radiation-induced hemorrhagic cystitis treated at our institution between May 1988 and December 2001 were reviewed retrospectively. All patients received HBO2 therapy at 2.36 atm absolute pressure, with 90 minutes of 100% oxygen breathing per treatment. The outcome was assessed after at least 12 months of follow-up. We evaluated patient demographics, types of pelvic malignancy and radiotherapy, total radiation dose, onset and severity of hematuria, and prior intravesical management. Clinical improvement was defined as the absence of, or reduction in, macroscopic hematuria. RESULTS: A total of 60 patients (55 men and 5 women), mean age 70 years, received an average of 33 HBO2 treatments (range 9 to 63). Of the 60 patients, 48 (80%) had either total or partial resolution of hematuria. When treated within 6 months of hematuria onset, 96% (27 of 28) had complete or partial symptomatic resolution (P = 0.003). All 11 patients with previous clot retention had clinical improvement if treated within 6 months of hematuria onset (P = 0.007). Prior intravesical chemical instillation

did not affect the clinical outcome. Patients who had undergone primary, adjuvant, or salvage external beam pelvic radiotherapy showed response rates of 81%, 83%, and 78%, respectively (P = 0.950). CONCLUSIONS: Our results show that delivery of HBO2 therapy within 6 months of hematuria onset is associated with a greater therapeutic response rate. Treatment efficacy was independent of prior intravesical therapy and the timing of radiotherapy.

PMID: 15833500 [PubMed - indexed for MEDLINE]

47: Kaohsiung J Med Sci. 2005 Feb;21(2):88-92.

Treatment of laryngeal radionecrosis with hyperbaric oxygen therapy: a case report.

Hsu YC, Lee KW, Ho KY, Tsai KB, Kuo WR, Wang LF, Chiang FY.

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An 81-year-old male with early-stage laryngeal carcinoma had been treated with 60 Gy curative radiotherapy. He complained of a sore throat, foul odor in the mouth, progressive dyspnea, and fever 2 months after the completion of radiotherapy. Direct laryngoscopy revealed narrowing of the glottis with diffuse ulcerative necrotic tissue. Biopsies at multiple sites and pathology revealed intense coagulation necrosis with complete denudation of covering epithelium without any malignancy. Since laryngeal radionecrosis was suspected, the patient received hyperbaric oxygen (HBO) therapy 40 times for 1 hour of 100% O2 at 2 atm absolute pressure. His clinical symptoms gradually improved and repeated endolaryngeal biopsies were undertaken near the end of HBO therapy and again 6 months later. The patient's larynx healed completely with diffuse fibrosis and no malignant cells were found on pathology. Radionecrosis must be differentiated from cancer recurrence following curative radiotherapy for early laryngeal cancer. HBO therapy could be a useful treatment adjunct for laryngeal radionecrosis.

Publication Types: Case Reports

PMID: 15825695 [PubMed - indexed for MEDLINE]

48: Am J Surg. 2005 Apr;189(4):467-8.

Comment on: Am J Surg. 2005 Apr;189(4):462-6.

The story of hyperbaric oxygen continues.

Fry DE.

Publication Types: Comment Editorial

PMID: 15820463 [PubMed - indexed for MEDLINE]

49: Am J Surg. 2005 Apr;189(4):462-6.

Comment in: Am J Surg. 2005 Apr;189(4):467-8.

Hyperbaric oxygen as adjuvant therapy in the management of necrotizing fasciitis.

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BACKGROUND: Necrotizing fasciitis (NF) is an uncommon but serious infection of fascia and skin associated with considerable morbidity and mortality. One modality proposed for improving the outcome of this condition is hyperbaric oxygen (HBO) therapy. This is a form of medical treatment that involves intermittent inhalation of 100% oxygen under pressures exceeding the atmosphere. The aim of this article is to review current practice and evidence for the use of HBO as adjunctive therapy in the management of NF. METHODS: A survey of published English literature through searches of Medline and PubMed was carried out using the following key words: "necrotizing fasciitis," "Fournier's gangrene," "necrotizing soft tissue infections," "hyperbaric oxygen therapy," "and hyperbaric oxygen chambers." RESULTS: The results of studies on the use of HBO therapy in NF are inconsistent. Some studies have demonstrated that HBO can improve patient survival and decrease the number of debridements required to achieve wound control, whereas others have failed to show any beneficial effect. CONCLUSIONS: Encouraging results have been achieved with the addition of HBO therapy to standard treatment

regimes, thus justifying further research in this field. More robust evidence by way of a prospective randomized trial is necessary before widespread and routine use of HBO in the management of NF can be recommended.

Publication Types: Review

PMID: 15820462 [PubMed - indexed for MEDLINE]

50: Head Neck. 2005 May;27(5):362-9. Effects of hyperbaric oxygen exposure on experimental head and neck tumor growth, oxygenation, and vasculature.

Shi Y, Lee CS, Wu J, Koch CJ, Thom SR, Maity A, Bernhard EJ.

Department of Radiation Oncology, University of Pennsylvania, 195 John Morgan Building, 37th and Hamilton Walk, Philadelphia, PA 19104-6072, USA.

BACKGROUND: Hyperbaric oxygen (HBO2) is used to promote healing in irradiated tissues, but concern persists about the possibility that it may promote residual tumor growth. METHODS: The tumor growth of SQ20B and Detroit 562 head and neck squamous cell carcinoma xenografts were studied after single-dose irradiation and 5x/week HBO2 treatment at 2.4 atm absolute for 90 minutes. The effect of HBO2 treatment on tumor hypoxia and vasculature was also examined by immunohistochemical analysis. RESULTS: HBO2 treatment increased tumor oxygenation during the treatment interval but did not promote the growth of either irradiated or unirradiated tumors. No increase in tumor vascular endothelial growth factor expression or vascularization was detected. CONCLUSIONS: This study found no evidence for persistent changes in tumor microenvironment or tumor growth promotion caused by hyperbaric oxygen exposure. 2005 Wiley Periodicals, Inc.

PMID: 15818558 [PubMed - indexed for MEDLINE]

51: Crit Care Med. 2005 Apr;33(4):909-10.

Comment on: Crit Care Med. 2005 Apr;33(4):841-6.

Bubbles in the brain: what to do for arterial gas embolism?

Moon RE.

Publication Types: Comment  
Editorial  
PMID: 15818131 [PubMed - indexed for MEDLINE]

52: Crit Care Med. 2005  
Apr;33(4):841-6.

Comment in: Crit Care Med. 2005  
Apr;33(4):909-10.

Effects of hyperbaric treatment in cerebral air embolism on intracranial pressure, brain oxygenation, and brain glucose metabolism in the pig.

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OBJECTIVE: To evaluate the effects of hyperbaric oxygen treatment after cerebral air embolism on intracranial pressure, brain oxygenation, brain glucose/lactate metabolism, and

electroencephalograph. DESIGN: Prospective animal study. SETTING: Hyperbaric chamber. SUBJECTS: Eleven Landrace/Yorkshire pigs. INTERVENTIONS: In 11 anesthetized pigs, intracranial pressure and brain oxygenation were measured with microsensor technology, brain glucose/lactate by microdialysis, and electroencephalograph by conventional methods. After injection of air into the internal carotid artery, animals were treated immediately (at 3 mins;  $t = 3$ ) or at 60 mins ( $t = 60$ ) with U.S. Navy Treatment Table 6 for 4.48 hrs.

RESULTS: At the end of hyperbaric oxygen treatment, intracranial pressure in the  $t = 60$  group ( $39 \pm 8$  mm Hg) was significantly higher than in the  $t = 3$  group ( $27 \pm 6$  mm Hg), brain oxygenation values for group  $t = 3$  and  $t = 60$  were  $66 \pm 14$  and  $52 \pm 15$  mm Hg, respectively (no significant difference from baseline), and there were no pathologic scores in the visually assessed electroencephalograph. However, there was a significant decrease in brain glucose and a significant increase in brain lactate in both groups at the end of the 5-hr study period. CONCLUSIONS: Hyperbaric oxygen treatment initiated at both 3 and 60 mins after embolization decreased the deleterious effects of cerebral air

embolism on intracranial pressure and brain metabolism. Therefore, this model appears suitable to test the application of hyperbaric oxygen treatment with a delay  $>60$  mins after embolization, as is often the case in the clinical situation.

PMID: 15818114 [PubMed - indexed for MEDLINE]

53: Crit Care Med. 2005  
Apr;33(4):813-8.

Resuscitation from experimental heatstroke by hyperbaric oxygen therapy.

Tsai HM, Gao CJ, Li WX, Lin MT, Niu KC.

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OBJECTIVE: Heatstroke is characterized by hyperthermia, vasoplegic shock, and cerebral ischemia and hypoxia. Hyperbaric oxygen (HBO) has been shown to reduce brain ischemia and behavioral dysfunction during cerebral artery occlusion. The efficacy of HBO therapy for resuscitation from heatstroke remains to be determined in the laboratory. DESIGN:

Anesthetized rats were randomized to several groups and administered: 1) no resuscitation (normobaric air) after onset of heatstroke, 2) HBO for 1 hr (100% oxygen at 253 kPa for 1 hr), 3) cyclic HBO intermitted by a 5-min air break for 1 hr of treatment (100% oxygen at 253 kPa), 4) hyperbaric air (air at 253 kPa for 1 hr), 5) normobaric hyperoxia (100% oxygen at 101 kPa for 1 hr), or 6) 8% HBO (hyperbaric 8% oxygen at 253 kPa for 1 hr). SETTING: Laboratory investigation. SUBJECTS: Sprague-Dawley rats (300- to 400-g males). INTERVENTIONS: Rats were exposed to an ambient temperature of 43 degrees C to induce heatstroke. Their colonic temperature; mean arterial pressure; heart rate; arterial blood levels of pH,  $Paco_2$ ,  $Pao_2$ ,  $So_2\%$ , and tumor necrosis factor- $\alpha$ ; the cortical levels of ischemic and damage markers, and cortical neuronal damage scores were determined. The moment at which mean arterial pressure began to decrease from peak levels was arbitrarily taken as the onset of heatstroke. MAIN RESULTS: Survival time (interval between onset of heatstroke and animal death) was 19

+/- 1 (n = 10), 131 +/- 18 (n = 14), 159 +/- 28 (n = 13), 72 +/- 14 (n = 10), 68 +/- 12 (n = 10), and 45 +/- 11 (n = 10) mins, respectively, for normobaric air, HBO for 1 hr, cyclic HBO, hyperbaric air, normobaric hyperoxia, and 8% HBO groups. The heatstroke induced arterial hypotension and bradycardia, decreased arterial levels of pH, Pao<sub>2</sub>, and So<sub>2</sub>%, increased arterial levels of tumor necrosis factor-alpha, and increased values of cellular ischemia and damage markers. In addition, neuronal damage scores in the cortex were significantly reduced by HBO for 1 hr and cyclic HBO resuscitation. CONCLUSION: We successfully demonstrated that HBO and, to some extent, hyperbaric air, normobaric hyperoxia, or HBO 8% was found beneficial in resuscitating rats with experimental heatstroke. HBO effectively reduced heatstroke-induced arterial hypotension, hypoxia, plasma tumor necrosis factor-alpha overproduction, and cerebral ischemia and damage and improved survival. PMID: 15818110 [PubMed - indexed for MEDLINE]

54: Can J Anaesth. 2005 Apr;52(4):403-8.  
Hyperbaric treatment of cerebral air embolism in an infant with cyanotic congenital heart disease.  
LeDez KM, Zbitnew G.  
Department of Anesthesia, Memorial University of Newfoundland, Health Sciences Centre, 300 Prince Phillip Drive, St. John's, Newfoundland A1B 3V6, Canada. kledez@mun.ca  
PURPOSE: Infants with cyanotic congenital heart disease are at risk for cerebral arterial gas embolism (CAGE) from iv infusion lines. Concern about the hazards and difficulty of caring for such patients inside a hyperbaric chamber may deter referral. We report a complex case in which a small infant was managed successfully using a modified hyperbaric oxygen treatment (HBOT) schedule. CLINICAL FEATURES: A four-month-old 6.19 kg male infant with a recent Glenn shunt for double-outlet right ventricle had a seizure and became unstable immediately after an iv drug infusion. The patient was sedated, intubated and ventilated and

dobutamine was commenced. A computerized tomography (CT) scan performed ten hours later demonstrated three intracranial air bubbles. About ten hours later the patient was referred for HBOT which commenced soon afterwards in a multiplace chamber. Since the right-to-left shunt would greatly increase the risk of decompression illness from breathing hyperbaric air HBOT was modified by the use of an abbreviated schedule at reduced pressure. Two 90-min HBOT sessions were administered within 24 hr at 38 feet of sea-water pressure, equivalent to 2.15 atmospheres absolute without any air break. During treatment the infant was ventilated using an Oxford Penlon ventilator. A subsequent CT scan demonstrated the absence of air. After extubation he appeared neurologically intact except for some weakness of the left arm. CONCLUSION: Hyperbaric oxygen may be utilized to treat CAGE in small infants with right-to-left shunt and should be commenced promptly. Publication Types: Case Reports PMID: 15814756 [PubMed - indexed for MEDLINE]

55: Transplant Proc. 2005 Jan-Feb;37(1):450-2.  
Augmentation of transgene expression in cold-preserved organs using vascular endothelial growth factor receptor-mediated adenoviral vector combined with hyperbaric oxygen.  
Hayashi S, Liu DK, Yagi H, Takagi H, Nakao A.  
Department of Surgery, National East Nagoya Hospital, Nagoya, Aichi, Japan.  
Adenovirus-mediated gene transfer has been widely used in gene therapy for congenital metabolic, cardiovascular, and malignant diseases. It has been reported that a gene transfer technique into transplanted organs may suppress rejection reactions and inhibit preservation injury. However, the magnitude of transgene expression in organs preserved at a cold temperature remains to be determined. In this study, we compared the transgene expression using vascular endothelial growth factor receptor (VEGFR)-mediated adenoviral vector at cold versus warm temperatures alone and combined

with hyperbaric oxygen in cold-preserved organs. The transgene expression by porcine endothelial cells transduced with adenoviral vector was significantly higher after a 24 hour-incubation at warm temperature than after a 1 hour-incubation with warm or cold temperature. Moreover, the transgene expression of after a 1-hour incubation at cold temperature was significantly lower than a 1-hour incubation at warm temperature. The VEGFR-mediated adenoviral vector augmented transgene expression during a 1-hour incubation at cold temperature compared to the control vector. A/J skin graft survival in C3H mice was significantly prolonged compared to control or standard vector with CTLA4Ig cDNA using VEGFR-mediated adenoviral vector with CTLA4Ig cDNA in a 1-hour cold preservation. Furthermore, combined use of VEGFR-mediated adenoviral vector with CTLA4Ig cDNA plus FK506 showed an augmented effect on graft prolongation. It is concluded that adenovirus-mediated gene transfer in 1-hour cold-preserved organ is difficult compared to that in the warm condition. However, VEGFR-mediated gene transfer can augment the transgene expression in 1-hour cold-preserved organs, followed by the effective suppression of rejection reactions in allogeneic transplantation.  
PMID: 15808673 [PubMed - indexed for MEDLINE]

56: Brain Behav Immun. 2005 May;19(3):217-22.

Comment in: Brain Behav Immun. 2005 May;19(3):201-2.

Hyperbaric oxygen therapy ameliorates stress-impaired dermal wound healing.

Gajendrareddy PK, Sen CK, Horan MP, Marucha PT.

Department of Oral Biology, College of Dentistry, The Ohio State University, Columbus, OH 43210, USA. Psychological stress has been shown to dysregulate healing in both humans and animals. Studies indicate the possibility for decreased oxygen supply, and increased oxygen demand, in the wounds of the stressed animals. Oxygen is an important mediator of wound healing, and its availability can limit healing rate. Hence, in a mouse model of stress-

impaired healing, the hypothesis that hyperbaric oxygen therapy would ameliorate the effect of stress on dermal wound healing was tested. Hyperbaric oxygen therapy (HBO) twice a day during early wound healing significantly ameliorated the effects of stress, bringing healing to near-control levels. There was no significant effect of HBO on the wounds of control animals. Wound inducible nitric oxide synthase (iNOS), modulated by psychological stress and oxygen balance, was studied for gene expression by real-time PCR. Expression of iNOS increased in stressed mice on days 1 (205%;  $p < .0001$ ), 3 (96%;  $p < .03$ ), and 5 (249%;  $p < .03$ ), post-wounding. HBO treatment of the stressed animals decreased iNOS expression by 62.6% ( $p < .02$ ) day 1 post-wounding. There was no significant effect of HBO on wound healing and iNOS expression in the control animals. Methods aimed at increasing tissue oxygenation, like HBO, have a high therapeutic potential. Their molecular mechanisms, implicated in wound healing, elude clarification due to the lack of appropriate animal models. Our current findings represent the first experimental evidence, demonstrating that HBO corrects stress-impaired dermal wound healing.

PMID: 15797310 [PubMed - indexed for MEDLINE]

57: Brain Behav Immun. 2005 May;19(3):201-2.

Comment on: Brain Behav Immun. 2005 May;19(3):207-16. Brain Behav Immun. 2005 May;19(3):217-22.

Stress relief by oxygen?

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Publication Types: Comment

PMID: 15797307 [PubMed - indexed for MEDLINE]

58: Undersea Hyperb Med. 2005 Jan-Feb;32(1):61-83.

A systematic review of the application of hyperbaric oxygen in the treatment of severe anemia: an evidence-based approach.

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The treatment of severe anemia with hyperbaric oxygen (HBO<sub>2</sub>) is one of thirteen indications approved by the Hyperbaric Oxygen Therapy Committee of the Undersea and Hyperbaric Medical Society for appropriate use of the therapy (1). This paper systematically reviews the literature reporting the use of HBO<sub>2</sub> therapy in the treatment and management of severe anemia. Increasingly, a trend to use standards of evidence-based medicine to evaluate the effectiveness of therapeutic interventions in injury and illness is productively with us in medicine today. At issue is discovery and evaluation of the best evidence available in world medical literature for evaluation of current treatment of the individual patient. The best evidence is a published randomized controlled prospective human trial; at the other end of the spectrum, the least valued evidence is a published expert opinion. In this review thirty-five publications have been reviewed as representing published results of applying HBO<sub>2</sub> in treatment of severe anemia. Each article underwent the evidence-based evaluative grading of the American Heart Association system (AHA), the National Cancer Institute Patient Data Query system (NCI-PDQ), and the British Medical Journal's (BMJ) Clinical Evidence system. Comparative results using the three systems of evaluation are presented in tabular form for the reader. All publications report a positive result when HBO<sub>2</sub> is delivered as treatment for severe anemia. Other alternatives other than transfusion with autologous or heterologous matched blood products are helpful but most too have not been the subject of prospective human randomized controlled trials. HBO<sub>2</sub> may be used adjunctively with hematinics, fluorocarbons, and cell wall free polymerized hemoglobin (currently fluorocarbons and cell wall free polymerized hemoglobin are not available for routine use in the United States, but both are undergoing advanced stage clinical trials at the time of this review).

Publication Types: Review  
PMID: 15796315 [PubMed - indexed for MEDLINE]

59: Undersea Hyperb Med. 2005 Jan-Feb;32(1):21-6.

Hyperbaric treatment of patients with carbon monoxide poisoning in the United States.

Hampson NB, Little CE.

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INTRODUCTION: Hyperbaric oxygen (HBO<sub>2</sub>) is effective therapy for carbon monoxide (CO) poisoning. In recent years, many hyperbaric physicians in the US have felt that numbers of patients referred for treatment of CO poisoning have decreased. Further, since the 2002 Weaver et al study (5), there has been discussion regarding the best treatment protocol. This study was conducted to determine numbers of patients treated with HBO<sub>2</sub> annually over the past decade in the US and whether there is a consensus about the number of treatments per patient. MATERIALS AND METHODS: A survey was mailed to all US facilities listed in the 2001 UHMS Chamber Directory. Two subsequent mailings were sent to survey nonresponders, followed by telephone contacts. RESULTS: Of the 320 facilities listed in the directory, 10 were nonresponders, 26 had closed since publication and 80 do not treat CO poisoning, leaving 204 facilities. From 1992-2002, a total of 16,367 patients were treated with HBO<sub>2</sub> for CO poisoning, an average of 1,488 +/- 121 patients/year (mean < or = SD). While the total number of patients treated annually did not decrease during the period studied, the number treated per facility did decline as a result of an increase in number of treating facilities. Only 46 facilities (23%) automatically give more than 1 hyperbaric treatment per CO-poisoned patient. Among those that do, 20 facilities (10%) give 3 treatments per patient. Conversely, 136 (67%) sometimes give more than one treatment and 12 facilities (8%) never retreat. CONCLUSIONS: Approximately 1,500 CO-poisoned patients are treated with HBO<sub>2</sub> in the US annually, a number that has

remained relatively constant since 1992. The majority of facilities does not routinely give more than one hyperbaric treatment, but will give repetitive treatment in certain situations.

PMID: 15796311 [PubMed - indexed for MEDLINE]

60: Undersea Hyperb Med. 2005 Jan-Feb;32(1):1-9.

Effects of hyperbaric oxygen therapy on experimental burn wound healing in rats: a randomized controlled study.

Bilic I, Petri NM, Bezic J, Alfirovic D, Modun D, Capkun V, Bota B.

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A body of data supports the efficacy of hyperbaric oxygen (HBO<sub>2</sub>) therapy in the treatment of thermal burns, but the role of HBO<sub>2</sub> in the treatment of burn injury remains a subject of controversy. The aim of this study was to evaluate possible positive effects of HBO<sub>2</sub> on the experimental burn wound healing. Deep second degree burns were produced on the depilated backs of 70 male Wistar rats using a validated burn protocol. The animals were assigned randomly to one of two groups: 35 to the control group, which was treated with silver sulphadiazine and placebo gas, and 35 to the experimental group, which was treated with silver sulphadiazine and HBO<sub>2</sub>. The main outcome measure was wound healing, characterized by formation of post-burn edema, neoangiogenesis, number of regenerative active follicles, necrosis staging, margination of leukocytes, and time of epithelization. A significant reduction of the post-burn edema after treatment with HBO<sub>2</sub> ( $p = 0.009$ ) was found. HBO<sub>2</sub> had a beneficial effect on neoangiogenesis ( $p = 0.009$ ). The number of preserved regenerative active follicles was significantly higher ( $p = 0.009$ ) and epithelial regeneration was more rapid in the experimental group ( $p = 0.048$ ). There were no significant differences for margination of leukocytes ( $p = 0.55$ ) or necrosis staging ( $p = 1.00$ ). These data further support earlier conclusions

that HBO<sub>2</sub> is beneficial in the healing of burn wounds.

PMID: 15796309 [PubMed - indexed for MEDLINE]

61: Mutat Res. 2005 May 2;572(1-2):167-72.

Interaction of hyperbaric oxygen, nitric oxide, and heme oxygenase on DNA strand breaks in vivo.

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Hyperbaric oxygen (HBO), e.g. pure oxygen breathing at supra-atmospheric pressures, represents a well-suited model for investigating oxidative stress-induced DNA damage as well as protective mechanisms. While the induction of heme oxygenase-1 (HO-1) seems to be crucial for this protection against this DNA damage, the role of nitric oxide (NO) remains unclear. HO-1 expression is a major regulator of the inducible NO synthase (iNOS), and therefore we investigated the effect of the interaction between HBO, NO, and HO-1 on DNA damage. Prior to exposure to HBO (3 h at 3 bar ambient pressure) rats randomly received vehicle (HBO alone, 1 mL 0.9% saline,  $n=8$ ), the NO donor molsidomine (SIN-10, 40 mg/kg,  $n=8$ ) or the HO-1 blocker tin-mesoporphyrin (Sn-MP, 50 micromol/kg,  $n=8$ ). Additional groups received SIN-10 without exposure to HBO, i.e. breathing air under normobaric conditions for 3h (SIN-10 alone, 40 mg/kg,  $n=6$ ), vehicle without HBO (negative controls,  $n=6$ ), and ethylmethanesulfonate without HBO (EMS, 200 mg/kg) (positive controls  $n=4$ ). Immediately after the 3 h HBO or air breathing period blood was analysed for DNA strand breaks (tail moment in the alkaline comet assay) and nitrite+nitrate (chemoluminescence). Whereas the tail moment was ten-fold higher after EMS than in the negative controls, there was no effect of HBO nor SIN-10 alone. Together with HBO, pretreatment with SIN-10 doubled the tail moment, and Sn-MP increased it by 50%. In contrast to Sn-MP or HBO alone, SIN-10 resulted in a five-fold increase of nitrite+nitrate

concentrations. We conclude that both HO-1 blockade and excess NO release promote DNA damage during HBO exposure in vivo. The effect of HO-1 inhibition is probably independent of the regulatory function of HO-1 for iNOS.

PMID: 15790500 [PubMed - indexed for MEDLINE]

62: Brain Res. 2005 Mar 10;1037(1-2):134-8.

Hyperbaric oxygen induces rapid protection against focal cerebral ischemia.

Veltkamp R, Siebing DA, Heiland S, Schoenffeldt-Varas P, Veltkamp C, Schwaninger M, Schwab S.

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**BACKGROUND AND PURPOSE:** The timing and mechanisms of protection by hyperbaric oxygen (HBO) in cerebral ischemia have only been partially elucidated. We monitored the early in vivo effects of HBO after 2 h transient focal ischemia using repetitive MRI. **METHODS:** Wistar rats underwent filament occlusion of the middle cerebral artery (MCAO). 40 min after MCAO, rats were placed in a HBO chamber and breathed either 100% O<sub>2</sub> at 3.0 atmospheres absolute (ata; n = 24) or at 1.0 ata (control; n = 24) for 1 h. Diffusion, perfusion and T2-weighted MR-images were obtained after 15 min and 3, 6 and 24 h of reperfusion. In 6 axial MR slices, volume of abnormal diffusion and T2w signals were measured in the ischemic hemisphere. Furthermore, hemispheric mean apparent diffusion coefficient-(ADC) and T2 values were calculated for statistical analysis. **RESULTS:** HBO significantly reduced volume of abnormal DWI signal beginning immediately after reperfusion (control: 92 +/- 28 mm<sup>3</sup>; HBO: 64 +/- 17) and lesion size on T2w (control: 375 +/- 91 mm<sup>3</sup>; HBO: 225 +/- 39) after 24 h. Correspondingly, mean ADC levels were lower and T2 values higher in the ischemic hemisphere in the control group. HBO reduced histological infarct size at 24 h. **CONCLUSION:** High-dose intrainfarct HBO therapy has an immediate protective on the brain

which is superior to normobaric oxygen.

PMID: 15777761 [PubMed - indexed for MEDLINE]

63: Rev Assoc Med Bras. 2005 Jan-Feb;51(1):46-50. Epub 2005 Mar 15.

[Viability of the spleen in rats after ligation of the splenic vessels: effects of hyperbaric oxygen therapy]

[Article in Portuguese]

Paulo DN, Kalil M, Grillo Junior LS, Borges EB, Cintra LC, Pereira FE, da Silva AL.

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**OBJECTIVE:** To investigate the effects of splenic artery and vein ligation and the influence of hyperbaric oxygen after the double vascular ligation on the viability of spleen tissue. **METHODS:** Sixty nine adult male Wistar rats (285-375 g) were randomly separated in three groups: group 1, four rats, sham operated, group 2, 34 rats, submitted to simultaneous splenic artery and vein ligation and group 3, 31 rats, submitted to hyperbaric oxygen during 11 days, after double vascular ligation. All animals were killed on day 12 after surgery. The spleen was removed and paraffin embedded for microscopic examination. **RESULTS:** In the groups submitted to vascular ligation, the spleen was normal in 8.82% of rats not treated with hyperbaric oxygen and in 45.16% of rats that received hyperbaric oxygen after vascular ligation (p=0.01). In the spleens with white infarct, the mass of preserved splenic tissue in relation to the total body mass did not differ between the groups treated or not with hyperbaric oxygen. The preserved splenic tissue had normal histology in both groups. The healing process was more accelerated in the group of rats treated with hyperbaric oxygen. **CONCLUSION:** Results demonstrate that exposure to hyperbaric oxygen increased the frequency of total spleen mass preservation after simultaneous ligation of the splenic artery and vein but did not alter the percentage of the spleen's viable area, however the healing process in necrotic areas was accelerated.

PMID: 15776185 [PubMed - indexed for MEDLINE]

64: Saudi Med J. 2005 Jan;26(1):163-4; author reply 164.

Comment on: Saudi Med J. 2004 Jul;25(7):890-4.

Hyperbaric medicine for necrotizing fasciitis.

Al-Waili NS, Butler G, Abdullah M, Qazi SA.

Publication Types: Comment Letter

PMID: 15756386 [PubMed - indexed for MEDLINE]

65: Hawaii Med J. 2005 Jan;64(1):12-3.

Concomitant cerebral and coronary arterial gas emboli in a sport diver: a case report.

Smerz RW.

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This report presents a case of concomitant cerebral and coronary gas emboli seen in a sport scuba diver after suffering from pulmonary barotrauma. Except for massive fatal gas embolism, no case of concomitant cerebral and coronary arterial gas emboli has been reported. The 45 year old male diver rapidly surfaced from a depth of 32 feet of sea water and experienced transient loss of consciousness, chest pain, and hemiparesis. EKG and cardiac enzymes suggested myocardial ischemia. He received three recompression treatments and recovered completely.

Publication Types: Case Reports  
PMID: 15751753 [PubMed - indexed for MEDLINE]

66: Int J Technol Assess Health Care. 2005 Winter;21(1):151.

Comment on: Int J Technol Assess Health Care. 2003 Summer;19(3):521-5.

Double-blind randomized control trial in acute carbon monoxide poisoning.

Weaver L.

Publication Types: Comment Letter

PMID: 15736527 [PubMed - indexed for MEDLINE]

67: Am J Surg. 2005 Feb;189(2):155-60.

An evaluation of low molecular weight heparin and hyperbaric oxygen

treatment in the prevention of intra-abdominal adhesions and wound healing.

Arikan S, Adas G, Barut G, Toklu AS, Kocakusak A, Uzun H, Kemik O, Daduk Y, Aydin S, Purisa S.

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BACKGROUND: Abdominal surgery can lead to intra-abdominal adhesions with significant morbidity and mortality. To prevent adhesions, an experimental study was planned to designate the effects of low molecular weight (LMW) heparins and hyperbaric oxygen (HBO) therapy both on the formation of adhesions and wound healing. METHODS: Thirty-eight Wistar albino rats underwent laparotomy to cause intra-abdominal adhesions by mechanical abrasion of the cecum and ethanol application. The rats were divided into 4 groups.

In the control group (group 1) no further management was undertaken. Group 2 was treated by Enoxaparine Na, group 3 received HBO therapy, and group 4 was given both enoxaparine Na and HBO treatment.

RESULTS: There was a statistically significant difference between the control and enoxaparine Na groups regarding adhesions. Statistically significant differences were observed between groups 1 and 4 and between groups 1 and 3 regarding the hydroxyproline content of the abdominal wounds. In the pathologic analysis of the abdominal wounds, there was no statistically significant difference between any of the groups, including the control group, regarding inflammation. Statistically significant differences were observed regarding angiogenesis between the control group and groups 3 and 4. There was also a statistically significant difference regarding fibrosis between groups 1 and 4. CONCLUSIONS: Enoxaparine Na decreased intra-abdominal adhesions, and HBO therapy had no beneficial effect on adhesions. Enoxaparine Na had no harmful effects on wound healing, and HBO therapy increased the process of wound healing.

PMID: 15720982 [PubMed - indexed for MEDLINE]

68: *Respir Physiol Neurobiol.* 2005 Feb 15;145(2-3):219-33.

The independently fractal nature of respiration and heart rate during exercise under normobaric and hyperbaric conditions.

West BJ, Griffin LA, Frederick HJ, Moon RE.

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To test the hypothesis that the fractal character of breathing and heart rate are independent, inter-breath intervals (IBI) and R-R intervals (RRI) were measured during rest and two levels of exercise at 1 and 2.8 ATA in a hyperbaric chamber in 18 male and female subjects (ages 19-74 years). Both RRI and IBI showed fractal properties. Fractal dimensions (D) for IBI were (mean  $\pm$  S.D.) 1.33  $\pm$  0.11, 1.29  $\pm$  0.12, 1.19  $\pm$  0.16 (rest, light and heavy exercise at 1ATA); 1.33  $\pm$  0.13, 1.25  $\pm$  0.13, 1.18  $\pm$  0.14 (same conditions at 2.8 ATA). Corresponding D for RRI were 1.19  $\pm$  0.11, 1.05  $\pm$  0.07 and 1.02  $\pm$  0.05 (1ATA); 1.20  $\pm$  0.10, 1.03  $\pm$  0.04 and 1.01  $\pm$  0.02 (2.8 ATA). The fractal dimension of each variable decreased with exercise and was unaffected by hyperbaric exposure. These two systems were not cross-correlated under any of the six conditions. During rest and light and moderate exercise at 1 and 2.8 ATA the results are consistent with heart rate variability and breathing rate variability being mutually independent of one another. PMID: 15705537 [PubMed - indexed for MEDLINE]

69: *J Cereb Blood Flow Metab.* 2005 May;25(5):554-71.

Mechanisms of hyperbaric oxygen-induced neuroprotection in a rat model of subarachnoid hemorrhage.

Ostrowski RP, Colohan AR, Zhang JH. Department of Physiology, Loma Linda University, Loma Linda, California, USA.

Acute cerebral ischemia occurs after subarachnoid hemorrhage (SAH) because of increased intracranial pressure (ICP) and decreased cerebral perfusion pressure (CPP). The effect of hyperbaric oxygen (HBO) on physiological and clinical outcomes after SAH, as well as the

expressions of hypoxia-inducible factor-1alpha (HIF-1alpha) and its target genes, such as BNIP3 and VEGF was evaluated. Eighty-five male SD rats (300 to 350 g) were randomly assigned to sham, SAH, and SAH+HBO groups. Subarachnoid hemorrhage was induced by endovascular perforation. Cortical cerebral blood flow (CBF), ICP, brain water content, brain swelling, neurologic function, and mortality were assessed. HBO (100% O<sub>2</sub>, 2.8 ATA for 2 h) was initiated at 1 h after SAH. Rats were sacrificed at 24 h to harvest tissues for Western blot or for histology. Apoptotic morphology accompanied by strong immunostaining of HIF-1alpha, VEGF, and BNIP3 were observed in the hippocampus and the cortex after SAH. Increased expressions of HIF-1alpha, VEGF, and BNIP3 were quantified by Western blot. HBO reduced the expressions of HIF-1alpha, VEGF, and BNIP3, diminished neuronal damage and improved CBF and neurologic function. HBO reduced early brain injury after SAH, probably by inhibition of HIF-1alpha and its target genes, which led to the decrease of apoptosis and preservation of the blood-brain barrier function.

PMID: 15703702 [PubMed - indexed for MEDLINE]

70: *Lab Anim.* 2005 Jan;39(1):116-21. Short duration hyperbaric oxygen treatment effects blood flow in rats: pilot observations.

Klemetti E, Rico-Vargas S, Mojon P. Faculty of Dentistry, Kuwait University, Kuwait. klemetti@hsc.edu.kw

Hyperbaric oxygen (HBO) treatment has been found to improve healing in living tissues, especially those poor in oxygen. The effects of HBO have also been tested in rat experiments. However, oxygen partial pressure in rat's arterial blood is normally about twice that in humans. Disregarding this, a human HBO protocol has been applied in previous rat experiments with HBO. Laser Doppler flowmetry (LDF) is a non-invasive means for measuring blood flow. Using LDF, we measured the blood perfusion rate in rats receiving HBO, according to a modified protocol, in a region of healing soft tissue with bone

defect. The results indicate that, in rats, shorter HBO treatment with high O<sub>2</sub> pressure can significantly improve the blood flow of healing tissues. In this study, an elevated blood perfusion rate was still evident 2 weeks after the ending of HBO therapy, which indicates improved revascularization in the wound area. A short HBO protocol would save time and effort in future HBO experiments on rats.  
PMID: 15703133 [PubMed - indexed for MEDLINE]

71: Strahlenther Onkol. 2005 Feb;181(2):113-23.

Hyperbaric oxygen and radiotherapy. Mayer R, Hamilton-Farrell MR, van der Kleij AJ, Schmutz J, Granstrom G, Sicko Z, Melamed Y, Carl UM, Hartmann KA, Jansen EC, Ditri L, Sminia P.

Department of Radiation Oncology, Medical University of Graz, Austria.

BACKGROUND: Hyperbaric oxygen (HBO) therapy is the inhalation of 100% oxygen at a pressure of at least 1.5 atmospheres absolute (150 kPa). It uses oxygen as a drug by dissolving it in the plasma and delivering it to the tissues independent of hemoglobin. For a variety of organ systems, HBO is known to promote new vessel growth into areas with reduced oxygen tension due to poor vascularity, and therewith promotes wound healing and recovery of radiation-injured tissue.

Furthermore, tumors may be sensitized to irradiation by raising intratumoral oxygen tensions.

METHOD: A network of hyperbaric facilities exists in Europe, and a number of clinical studies are ongoing. The intergovernmental framework COST B14 action "Hyperbaric Oxygen Therapy" started in 1999. The main goal of the Working Group Oncology is preparation and actual implementation of prospective study protocols in the field of HBO and radiation oncology in Europe.

RESULTS: In this paper a short overview on HBO is given and the following randomized clinical studies are presented: a) reirradiation of recurrent squamous cell carcinoma of the head and neck after HBO sensitization; b) role of HBO in enhancing radiosensitivity on glioblastoma multiforme; c)

osseointegration in irradiated patients; adjunctive HBO to prevent implant failures; d) the role of HBO in the treatment of late irradiation sequelae in the pelvic region. The two radiosensitization protocols (a, b) allow a time interval between HBO and subsequent irradiation of 10-20 min. CONCLUSION: Recruitment of centers and patients is being strongly encouraged, detailed information is given on [www.oxynet.org](http://www.oxynet.org).

Publication Types: Review  
PMID: 15702300 [PubMed - indexed for MEDLINE]

72: Eur J Pharmacol. 2005 Jan 31;508(1-3):249-54. Epub 2005 Jan 6. Hyperbaric oxygen protects against lipopolysaccharide-stimulated oxidative stress and mortality in rats.

Lin HC, Wan FJ, Wu CC, Tung CS, Wu TH.

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Free radicals and proinflammatory mediators have been implicated in the pathogenesis of endotoxic shock, a disease with high mortality caused by Gram-negative bacterial endotoxin. Hyperbaric oxygen is used as an adjuvant therapy for various inflammatory diseases and shows beneficial effects in lipopolysaccharide-induced shock syndrome. However, the underlying mechanisms for these effects are still to be defined. In this study, we investigated the effect of hyperbaric oxygen on inflammatory mediators, free radicals, and mortality in endotoxic rats. Wistar-Kyoto rats were injected with lipopolysaccharide (10 mg/kg) and then exposed to aminoguanidine, an inhibitor of inducible nitric oxide (NO) synthase (bolus injection 2 h after lipopolysaccharide), or hyperbaric oxygen (2 ATA for 60 min 1, 4, 9, and 24 h after lipopolysaccharide). Plasma tumor necrosis factor alpha (TNF-alpha), NO, and superoxide anion were detected and the vasorelaxation response and survival rate were assessed. The results demonstrated that increases in plasma TNF-alpha and NO, and the vasohyporeactivity induced by lipopolysaccharide

treatment were significantly inhibited by hyperbaric oxygen and aminoguanidine. Mortality and vascular superoxide anion production of lipopolysaccharide treatment were also markedly reduced by hyperbaric oxygen treatment, but were not restored by aminoguanidine. None of the parameters was changed by hyperbaric oxygen treatment alone. Thus, repeated hyperbaric oxygen exposure significantly attenuated the inflammatory mediators, free radicals, and mortality in endotoxic rats.

PMID: 15680278 [PubMed - indexed for MEDLINE]

73: Foot Ankle Int. 2005 Jan;26(1):15-8.

Hyperbaric oxygen as an intervention for managing wound hypoxia: its role and usefulness in diabetic foot wounds.

Strauss MB.

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Few topics in diabetic wound management generate as much "heated" discussion as hyperbaric oxygen (HBO). Hyperbaric oxygen is an intermittent inhalation therapy in which the patient breathes oxygen at greater than 1 atm of pressure. This requires placement of the patient into a sealed vessel (chamber) which is capable of withstanding pressurization. This article discusses the role of HBO as an adjunct to the management of diabetic problem foot wounds from evidenced-based, approved (by Medicare) indications and cost-effectiveness perspectives.

PMID: 15680113 [PubMed - indexed for MEDLINE]

74: Cochrane Database Syst Rev. 2005 Jan 25;(1):CD004739.

Hyperbaric oxygen for idiopathic sudden sensorineural hearing loss and tinnitus.

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BACKGROUND: Idiopathic sudden sensorineural hearing loss (ISSHL) with or without tinnitus is common

and presents a health problem with significant effect on quality of life. Hyperbaric oxygen therapy (HBOT) may improve oxygen supply to the inner ear and thereby result in an improvement in hearing and/or a reduction in the intensity of tinnitus. OBJECTIVES: To assess the benefits and harms of HBOT for treating ISSHL and tinnitus. SEARCH STRATEGY: We searched the Cochrane ENT Specialist Register (June 2004), CENTRAL (The Cochrane Library Issue 3, 2004), MEDLINE (1966 to 2004), EMBASE (1974 to 2004), CINAHL (1982 to 2004), DORCTHIM (1996 to 2004), and reference lists of articles. Researchers in the field were contacted. SELECTION CRITERIA: Randomised studies comparing the effect on ISSHL and/or tinnitus of therapeutic regimens which include HBOT with those that exclude HBOT. DATA COLLECTION AND ANALYSIS: Three reviewers independently evaluated the quality of the relevant trials using the validated Jadad 1996 Oxford-Scale and extracted the data from the included trials. MAIN RESULTS: Five trials contributed to this review (254 subjects, 133 receiving HBOT and 120 control). Pooled data from two trials involving 114 patients (45% of the total) suggested there was a trend towards, but no significant increase in, the chance of a 50% increase in hearing threshold on Pure Tone Average (PTA) over four frequencies when HBOT was used (relative risk (RR) for good outcome with HBOT 1.53, 95% confidence interval (CI) 0.85 to 2.78, P = 0.16). The chance of achieving a 25% increase with HBOT was, however, statistically significant (RR 1.39, 95% CI 1.05 to 1.84, P = 0.02). Fifty-six per cent of the control subjects achieved this outcome versus 78% of the HBOT subjects, with the number-needed-to-treat (NNT) to achieve one extra good outcome being 5 (95% CI 3 to 20). A single trial involving 50 subjects (20% of the total) also suggested a significant improvement in the mean PTA threshold expressed as a percentage of baseline (61% improvement with HBOT, 24% with control, WMD 37%, 95% CI 22% to 53%). The effect of HBOT in tinnitus could not be assessed due to poor reporting. There were no significant improvements in hearing or tinnitus

reported in the single study to examine the effect of HBOT on a chronic presentation (six months) of ISSHL and/or tinnitus. AUTHORS' CONCLUSIONS: For people with early presentation of ISSHL, the application of HBOT significantly improved hearing loss, but the clinical significance of the level of improvement is not clear. We could not assess the effect of HBOT on tinnitus by pooled analysis. The routine application of HBOT to these patients cannot be justified from this review. In view of the modest number of patients, methodological shortcomings and poor reporting, this result should be interpreted cautiously, and an appropriately powered trial of high methodological rigour is justified to define those patients (if any) who can be expected to derive most benefit from HBOT. There is no evidence of a beneficial effect of HBOT on chronic presentation of ISSHL and/or tinnitus.

Publication Types: Meta-Analysis Review

PMID: 15674964 [PubMed - indexed for MEDLINE]

75: Cochrane Database Syst Rev. 2005 Jan 25;(1):CD004712.

Hyperbaric oxygen therapy for promoting fracture healing and treating fracture non-union.

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BACKGROUND: Hyperbaric oxygen therapy (HBOT) consists of intermittently administering 100% oxygen at pressures greater than one atmosphere absolute (ATA) in a pressure vessel. This technology has been used to treat a variety of diseases and has been described as helping patients who have delayed healing or established non-union of bony fractures. OBJECTIVES: The aim of this review was to assess the evidence for the benefit of hyperbaric oxygen treatment (HBOT) for the treatment of delayed bony healing and established non-union of bony fractures. SEARCH STRATEGY: We searched the Cochrane Musculoskeletal Injuries Group trials register (to January week 3, 2004), the Cochrane Central Register

of Controlled Trials (The Cochrane Library Issue 4, 2003), MEDLINE (OVID 1966 to January week 3, 2004), CINAHL (OVID 1982 to January week 3, 2004), EMBASE (OVID 1980 to February 2004), the locally developed Database of Randomised Controlled Trials in Hyperbaric Medicine (available at [www.hboevidence.com](http://www.hboevidence.com)) from inception to March 2004, and reference lists of articles. SELECTION CRITERIA: We aimed to include all randomised controlled trials that compared the effect of HBOT with no HBOT (no treatment or sham). DATA COLLECTION AND ANALYSIS: Two authors using standardised forms attempted to extract data independently. MAIN RESULTS: No trials met the inclusion criteria. We excluded one trial that compared HBOT with no treatment because no clinical outcomes were reported. AUTHORS' CONCLUSIONS: This systematic review failed to locate any relevant clinical evidence to support or refute the effectiveness of HBOT for the management of delayed union or established non-union of bony fractures. Good quality clinical trials are needed to define the role, if any, of HBOT in the treatment of these injuries. Publication Types: Review  
PMID: 15674962 [PubMed - indexed for MEDLINE]

76: Cochrane Database Syst Rev. 2005 Jan 25;(1):CD002041.

Update of: Cochrane Database Syst Rev. 2000;(2):CD002041.

Hyperbaric oxygen for carbon monoxide poisoning.

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BACKGROUND: Poisoning with carbon monoxide (CO) remains an important cause of accidental and intentional injury worldwide. Several unblinded non-randomized trials have suggested that the use of hyperbaric oxygen (HBO) prevents the development of neurological sequelae. This has led to the widespread use of HBO in the management of patients with carbon monoxide poisoning. OBJECTIVES: To

examine randomized trials of the effectiveness of hyperbaric oxygen (HBO) compared to normobaric oxygen (NBO) for the prevention of neurologic sequelae in patients with acute carbon monoxide poisoning. SEARCH STRATEGY: We searched MEDLINE (1966-present), EMBASE (1980-present), and the Controlled Trials Register of the Cochrane Collaboration, supplemented by a manual review of bibliographies of identified articles and discussion with recognized content experts. SELECTION CRITERIA: All randomized controlled trials involving non-pregnant adults acutely poisoned with carbon monoxide (regardless of severity), with adequate or unclear allocation concealment. DATA COLLECTION AND ANALYSIS: Two reviewers independently extracted from each trial information on: the number of randomized patients, types of participants, the dose and duration of the intervention, and the prevalence of neurologic symptoms at follow-up. MAIN RESULTS: Seven randomized controlled trials of varying quality were identified; one was excluded because it did not evaluate clinical outcomes. Of the six remaining trials, two represent incomplete publications (one interim analysis, one abstract). Of these six trials, four found no benefit of HBO for the reduction of neurologic sequelae, while two others did. Although pooled analysis does not suggest a benefit from HBOT (OR for neurological deficits 0.78, 95%CI 0.54 to 1.12, p=0.18), significant methodologic and statistical heterogeneity was apparent among the trials, and this result should be interpreted cautiously. Moreover, design or analysis flaws were evident in all trials. Importantly, the conclusions of one positive trial may have been influenced by failure to adjust for multiple hypothesis testing, while interpretation of the other positive trial is hampered by apparent changes in the primary outcome during the course of the trial. AUTHORS' CONCLUSIONS: Existing randomized trials do not establish whether the administration of HBO to patients with carbon monoxide poisoning reduces the incidence of adverse neurologic outcomes. Additional research is needed to

better define the role, if any, of HBO in the treatment of patients with carbon monoxide poisoning. This research question is ideally suited to a multi-center randomized controlled trial.

Publication Types: Meta-Analysis Review

PMID: 15674890 [PubMed - indexed for MEDLINE]

77: Fertil Steril. 2005 Jan;83(1):226-8.

Hyperbaric oxygen and ovarian follicular stimulation for in vitro fertilization: a pilot study.

Van Voorhis BJ, Greensmith JE, Dokras A, Sparks AE, Simmons ST, Syrop CH.

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Our objective was to assess the safety and tolerability of hyperbaric oxygen therapy (HBO) as an adjunct to IVF therapy in women with a poor prognosis for pregnancy in a prospective observational pilot study. We conclude that HBO is well tolerated by women undergoing IVF treatment and that further study is required to determine whether this is an efficacious adjuvant therapy for women being treated by IVF.

PMID: 15652917 [PubMed - indexed for MEDLINE]

78: Pediatr Emerg Care. 2005 Jan;21(1):31-4.

Comment in: Pediatr Emerg Care. 2005 Jul;21(7):484; author reply 485.

Purpura fulminans successfully treated with hyperbaric oxygen--a report of 2 cases.

Krzelj V, Petri NM, Mestrovic J, Andric D, Biocic M.

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PMID: 15643321 [PubMed - indexed for MEDLINE]

79: Br J Surg. 2005 Jan;92(1):24-32. Systematic review of hyperbaric oxygen in the management of chronic wounds.

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**BACKGROUND:** Many therapeutic options exist for chronic wounds. Hyperbaric oxygen therapy (HBOT) is one such option. It may be used for diabetic, venous, arterial and pressure ulcers. **METHODS:** Following a systematic search of the literature, pooled analyses of predetermined clinical outcomes of randomized controlled trials involving the use of HBOT for chronic wounds were performed. Relative risks (RR) and number needed to treat (NNT) with 95 per cent confidence intervals (c.i.) were calculated. **RESULTS:** Six studies met the inclusion criteria. No appropriate trials were located for arterial and pressure ulcers. Pooled data from five trials on diabetic ulcers (118 patients) suggested a significant reduction in the risk of major amputation with HBOT (RR: 0.31; c.i. 0.13 to 0.71) with a NNT of 4 (c.i. 3 to 11). Sensitivity analyses did not alter the results. Ulcer healing and the rate of minor amputation were not influenced by HBOT. Data from one trial on venous ulcers suggested significant wound size reduction at the end of the treatment, but not at follow-up. **CONCLUSIONS:** There is evidence that HBOT reduces the risk of major amputation in diabetic patients. For venous, arterial or pressure ulcers there is a lack of data. Further trials may be warranted.

Publication Types: Review  
PMID: 15635604 [PubMed - indexed for MEDLINE]

80: J Clin Microbiol. 2005 Jan;43(1):529.

Comment on: J Clin Microbiol. 2004 Aug;42(8):3904-5.

First isolation of Burkholderia cepacia from a deep neck abscess in a diabetic patient successfully treated with hyperbaric oxygen.

Fadini GP, Tiengo A, Avogaro A.  
Publication Types: Case Reports  
Comment Letter

PMID: 15635038 [PubMed - indexed for MEDLINE]

81: Exp Neurol. 2005 Jan;191(1):198-210.

Multiple effects of hyperbaric oxygen on the expression of HIF-1

alpha and apoptotic genes in a global ischemia-hypotension rat model.

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Department of Neurosurgery, Louisiana State University Health Science Center, Shreveport, LA, USA. Hypoxia-inducible factor-1alpha (HIF-1alpha) is a transcription factor specifically activated by hypoxia. Activation of proapoptotic caspase-9 and caspase-3 pathways, by binding with tumor suppressor p53, HIF-1alpha could lead to harmful actions such as apoptosis. We examined whether increasing oxygen levels by hyperbaric oxygen (HBO) offers neuroprotection, at least partially by suppression of HIF-1alpha and apoptotic genes. Male SD rats (n = 78) were randomly divided into 13 groups: 1 sham group, 6 groups of global ischemia-hypotension (GI), and 6 groups of HBO treatment after global ischemia-hypotension (GI + HBO). HBO (3 ATA for 2 h) was applied at 1 h after global ischemia-hypotension. Rats were sacrificed at 6, 12, 24, 48, and 96 h and 7 days. Global ischemia-hypotension (10 min ischemia, 30-35 mm Hg) produced a marked increase of HIF-1alpha expressions in the hippocampus and cortex at 6 h and peaked at 48-96 h. The expressions of p53, caspase-9, and caspase-3 were all increased in a similar time course. These molecular changes were accompanied by massive cell loss in the hippocampal regions and to a lesser degree in the cortex, with features of apoptosis. HBO treatment reduced expressions of HIF-1alpha, p53, caspase-9, and caspase-3 and decreased cell death. The protein levels of proapoptotic caspase-8 and antiapoptotic bcl-2 were increased after global ischemia-hypotension and HBO potentiated the expression of caspase-8 and decreased expression of bcl-2. These results indicate that HBO has multiple actions on apoptotic genes even though the overall effect of HBO was decreased HIF-1alpha expression and reduced apoptosis after global ischemia-hypotension.

PMID: 15589527 [PubMed - indexed for MEDLINE]

82: J Appl Physiol. 2005 Apr;98(4):1309-13. Epub 2004 Dec 3. Optimal oxygen pressure and time for reduced bubble formation in the N<sub>2</sub>-saturated decompressed prawn. Ertracht O, Arieli R, Arieli Y, Ron R, Erlichman Z, Adir Y. Israel Naval Medical Institute, POB 8040, Haifa 31080, Israel. Bubbles that grow during decompression are believed to originate from preexisting gas micronuclei. We showed that pretreatment of prawns with 203 kPa oxygen before nitrogen loading reduced the number of bubbles that evolved on decompression, presumably owing to the alteration or elimination of gas micronuclei (Arieli Y, Arieli R, and Marx A. J Appl Physiol 92: 2596-2599, 2002). The present study examines the optimal pretreatment for this assumed crushing of gas micronuclei. Transparent prawns were subjected to various exposure times (0, 5, 10, 15, and 20 min) at an oxygen pressure of 203 kPa and to 5 min at different oxygen pressures (PO<sub>2</sub> values of 101, 151, 203, 405, 608, and 810 kPa), before nitrogen loading at 203 kPa followed by explosive decompression. After the decompression, bubble density and total gas volume were measured with a light microscope equipped with a video camera. Five minutes at a PO<sub>2</sub> of 405 kPa yielded maximal reduction of bubble density and total gas volume by 52 and 71%, respectively. It has been reported that 2-3 h of hyperbaric oxygen at bottom pressure was required to protect saturation divers decompressed on oxygen against decompression sickness. If there is a shorter pretreatment that is applicable to humans, this will be of great advantage in diving and escape from submarines. PMID: 15579569 [PubMed - indexed for MEDLINE]

83: J Neuroimaging. 2005 Jan;15(1):92-6. Diffuse cerebral air embolism treated with hyperbaric oxygen: a case report. Fowler MJ Jr, Thomas CE, Koenigsberg RA, Schwartzman RJ, Kantharia BK. Department of Neurology, Drexel University, College of Medicine, Philadelphia, Pennsylvania, USA.

A 54-year-old woman presented for cardiac evaluation of atypical chest pain. Workup included coronary angiography and a left ventriculogram, during which air was inadvertently injected, resulting in the development of an acute right hemisphere syndrome. Right carotid angiography was immediately performed, yielding only a delayed diffuse venous phase without focal vessel cutoffs. Within 60 minutes, the patient underwent hyperbaric oxygen therapy for the suspected cerebral air emboli. After removal from the chamber for technical reasons, she had a generalized tonic-clonic seizure, and further hyperbaric oxygen therapy was withheld. Initial computed tomography imaging obtained approximately 8 hours after symptom onset showed signs of early right hemispheric edema. Subsequent magnetic resonance imaging studies were markedly abnormal and suggestive of diffuse bilateral but predominantly right-sided parietal lobe edema with mildly positive diffusion-weighted imaging. Follow-up magnetic resonance imaging at 6 months was normal, and the patient's neurological examination returned to normal. Publication Types: Case Reports PMID: 15574583 [PubMed - indexed for MEDLINE]

84: J Appl Physiol. 2005 Jan;98(1):144-50. Epub 2004 Aug 20. Effects of nitrogen and helium on CNS oxygen toxicity in the rat. Arieli R, Ertracht O, Oster I, Vitenstein A, Adir Y. Israel Naval Medical Institute, Israel Defense Forces Medical Corps, POB 8040, Haifa 31080, Israel. rarieli@netvision.net.il The contribution of inert gases to the risk of central nervous system (CNS) oxygen toxicity is a matter of controversy. Therefore, diving regulations apply strict rules regarding permissible oxygen pressures (P<sub>O</sub>(2)). We studied the effects of nitrogen and helium (0, 15, 25, 40, 50, and 60%) and different levels of P<sub>O</sub>(2) (507, 557, 608, and 658 kPa) on the latency to the first electrical discharge (FED) in the EEG in rats, with repeated measurements in each animal. Latency as a function of the nitrogen

pressure was not homogeneous for each rat. The prolongation of latency observed in some rats at certain nitrogen pressures, mostly in the range 100 to 500 kPa, was superimposed on the general trend for a reduction in latency as nitrogen pressure increased. This pattern was an individual trait. In contrast with nitrogen, no prolongation of latency to CNS oxygen toxicity was observed with helium, where an increase in helium pressure caused a reduction in latency. This bimodal response and the variation in the response between rats, together with a possible effect of ambient temperature on metabolic rate, may explain the conflicting findings reported in the literature. The difference between the two inert gases may be related to the difference in the narcotic effect of nitrogen. Proof through further research of a correlation between individual sensitivity to nitrogen narcosis and protection by N(2) against CNS oxygen toxicity in rat may lead to a personal O(2) limit in mixed-gas diving based on the diver sensitivity to N(2) narcosis.  
PMID: 15322063 [PubMed - indexed for MEDLINE]

85: Eur Arch Otorhinolaryngol. 2005 Feb;262(2):163-4. Epub 2004 Mar 4.  
Comment on: Eur Arch Otorhinolaryngol. 2004 Aug;261(7):393-6.  
HBO effectively supports SSNHL therapy.  
Narozny W, Kuczkowski J, Mikaszewski B.  
Publication Types: Comment Letter  
PMID: 14999508 [PubMed - indexed for MEDLINE]