

## **Surgery**

### **Hyperbaric oxygen preconditioning improves postoperative cognitive dysfunction by reducing oxidant stress and inflammation.**

Gao ZX<sup>1</sup>, Rao J<sup>1</sup>, Li YH<sup>1</sup>.

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Postoperative cognitive dysfunction is a crucial public health issue that has been increasingly studied in efforts to reduce symptoms or prevent its occurrence. However, effective advances remain lacking. Hyperbaric oxygen preconditioning has proved to protect vital organs, such as the heart, liver, and brain. Recently, it has been introduced and widely studied in the prevention of postoperative cognitive dysfunction, with promising results. However, the neuroprotective mechanisms underlying this phenomenon remain controversial. This review summarizes and highlights the definition and application of hyperbaric oxygen preconditioning, the perniciousness and pathogenetic mechanism underlying postoperative cognitive dysfunction, and the effects that hyperbaric oxygen preconditioning has on postoperative cognitive dysfunction. Finally, we conclude that hyperbaric oxygen preconditioning is an effective and feasible method to prevent, alleviate, and improve postoperative cognitive dysfunction, and that its mechanism of action is very complex, involving the stimulation of endogenous antioxidant and anti-inflammation defense systems.

### **Early post-operative hyperbaric oxygen therapy modifies neutrophil activation.**

Ueno S, Tanabe G, Kihara K, Aoki D, Arikawa K, Dogomori H, Aikou T.

First Department of Surgery, Kagoshima University School of Medicine, Japan.

**BACKGROUND/AIMS:** To investigate the effect of acute hyperbaric oxygen therapy (HBOT) on post-operative sinusoidal endothelial cell (SEC) damage caused by activated neutrophils. **METHODOLOGY:** 12 non-cirrhotic patients (Group H), who underwent elective hepatectomy for liver cancer, were given 2 courses of HBOT: 2.0 atm with inhalation of 100% oxygen, for 60 min, at 3 hours and 24 hours after hepatectomy; they were then compared with the 12 patients (Group C) who had been treated to maintain normal hemodynamic values. **RESULTS:** In group H, peak levels of polymorphonuclear leukocyte elastase (PMNE) and thrombomodulin (TM) were clearly diminished and delayed compared to Group C. All subjects in Group C showed more than a 10% increase in CD18 12 hours after surgery; however, in Group H, the elevation of CD18 expression was clearly suppressed compared to Group C. No patient in Group H had post-operative hyperbilirubinemia or hepatic failure; however, 3 had post-operative hyperbilirubinemia and 1 had intraperitoneal infection in Group C. **CONCLUSIONS:** Our results provide direct evidence that HBOT, especially at 3 hours after hepatectomy, has favorable effects on the activation of neutrophils decreasing SEC injury.

### **Hyperbaric oxygen treatment of postoperative neurosurgical infections.**

Larsson A, Engstrom M, Uusijarvi J, Kihlstrom L, Lind F, Mathiesen T.

Department of Anaesthesiology and Intensive Care, Karolinska Hospital, Stockholm, Sweden.  
agneta.larsson@hbo.ks.se

**OBJECTIVE:** To evaluate the clinical usefulness of hyperbaric oxygen (HBO) therapy for neurosurgical infections after craniotomy or laminectomy. **METHODS:** The study involved review of medical records, office visits, and telephone contacts for 39 consecutive patients who were referred in 1996 to 2000. Infection control and healing without removal of bone flaps or foreign material, with a minimum of 6 months of follow-up monitoring, were considered to represent success. **RESULTS:** Successful results were achieved for 27 of 36 patients, with a mean follow-up period of 27 months (range, 6-58 mo). One patient discontinued HBO therapy because of claustrophobia, and two could not be evaluated because of death resulting from tumor recurrence. In Group 1 (uncomplicated cranial wound infections), 12 of 15 patients achieved healing with retention of bone flaps. In Group 2 (complicated cranial wound infections, with risk factors such as malignancy, radiation injury,

repeated surgery, or implants), all except one infection resolved; three of four bone flaps and three of six acrylic cranioplasties could be retained. In Group 3 (spinal wound infections), all infections resolved, five of seven without removal of fixation systems. There were no major side effects of HBO treatment. **CONCLUSION:** HBO treatment is an alternative to standard surgical removal of infected bone flaps and is particularly useful in complex situations. It can improve outcomes, reduce the need for reoperations, and allow infection control without mandatory removal of foreign material. HBO therapy is a safe, powerful treatment for postoperative cranial and spinal wound infections, it seems cost-effective, and it should be included in the neurosurgical armamentarium.

### **Hyperbaric oxygen therapy application in otorhinolaryngology and head and neck surgery: state of the art and review of literature**

Farri A, Pecorari GC, Enrico A, Sartoris A.

I Clinica ORL, Dipartimento di Fisiopatologia Clinica, Università di Torino.

Hyperbaric Oxygen Therapy (HOT) encompasses an extensive research area in which new indications, some of which are now well-codified, have emerged both in the fields of medical and surgical pathology. Its utilization in carefully targeted clinical situations, in which its true efficacy can be demonstrated, is first of all connected with medicolegal responsibility, in suspected iatrogenic accidents; its application must furthermore be subordinated to a favourable cost/benefit ratio for the health service employing it. In otorhinolaryngology and head and neck surgery, HOT is a strategic therapeutic weapon in several applications. Its most widely recognized indications are radiation lesions, chronic osteomyelitis of the mandible, head and neck infections, malignant external otitis, sudden hypoacusia, chronic tinnitus, encephalitis, treatment of the gaseous embolus, skin grafts, vascularized flaps, cervicoencephalic traumas. HOT indications as a radiosensitizing and/or chemiosensitizing factor are still being studied. Both a review of the literature and our experience appear, beyond any doubt, to confirm that HOT promotes faster recovery and reduces hospital stays, thus qualifying as a new therapeutic aid that complements the usual well-established methods.

### **Hyperbaric oxygen in trauma and surgical emergencies.**

MacFarlane C, Cronje FJ, Benn CA.

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Gauteng Health Department Emergency Medical Services-Johannesburg. macfarlaneca@ems.gpj.co.za

Hyperbaric oxygen therapy (HBO), that is the administration of 100% oxygen delivered under pressure, has a beneficial effect in several surgical conditions. Its use has been assessed and audited and its pharmacological effects demonstrated. It is appropriate for use in several acute surgical conditions as evidence-based therapy. These are: Gas Gangrene Crush Injuries, Compartment Syndromes & Acute Traumatic Ischaemias Enhancement of Healing in Selected Problem Wounds Exceptional Blood loss Anaemia Necrotising Soft Tissue Infections Compromised Skin Grafts & Flaps Thermal Burns HBO therapy suffers from previous inappropriate use, lack of knowledge, and scarce hyperbaric facilities. Hyperbaric therapy, when properly supervised by a physician trained in its use, working closely with a surgeon, and ethically used for appropriate indications, can be a useful adjunct to surgical practice. Military surgeons may be in a situation in which they can utilize HBO in acute surgical conditions and trauma. They are urged to identify HBO facilities, both fixed and portable, and to establish communication with hyperbaric therapy colleagues.

### **Anal canal mucinous adenocarcinoma with invasion of gluteus and perineum treated with surgery and hyperbaric oxygen therapy.**

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Jacomini C, Junqueira AE, Almeida AL, Parra RS, Rocha JJ, Féres O.

Division of Coloproctology, Department of Surgery and Anatomy. School of Medicine of Ribeirão Preto, University of São Paulo, Barzil.

The case of a 66-year-old female patient with late diagnosis of giant anal canal mucinous adenocarcinoma invading the gluteal and vulvar regions is reported. Because of the patient's severe clinical status and disease morbidity, surgical resection of the lesion was accomplished, with no adjuvant chemo- or radiotherapy. In the postoperative period, the patient received hyperbaric oxygen therapy, which facilitated and even accelerated local healing. Total closure of the raw flesh area was achieved, with no recurrence signals of cancer being detected after one-year follow-up. We are convinced that, in this difficult case, hyperbaric oxygen therapy played a crucial role in patient recovery and wound healing, allowing for early closure with good progression.