

The Biological Effects of Preconditioning Hyperbaric Oxygen Therapy in Pancreaticoduodenectomy: Results of a Randomized, Double-Blind Trial in Humans

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Context Hyperbaric oxygen (HBO) therapy involves the intermittent inhalation of 100% oxygen in chambers pressurized between 1.5 and 3.0 atmosphere absolute (ATA). HBO attenuates the production of pro-inflammatory cytokines in response to the inflammatory stimulus such surgery and the subsequent modulation of immune response. The positive role of HBO in human surgery was demonstrated only in cardiovascular and orthopedic surgery and after liver transplantation. Pancreaticoduodenectomy (PD) represents one of the most important surgical procedures burdened by a considerable number of local and systemic complication, ranging between 30 and 60%. **Objective** The main objective of this study was to identify the possible presence of major differences between the concentration of inflammatory cytokines in two study groups depending on the receiving or not HBO before PD procedure. Secondary objective was the comparison of the complication rate and hospital stay between the two study groups. **Materials and methods** The study was a prospective, randomized double-blind study lasting 6 months. Ethics approval was obtained from local ethics committee (2176/2012). Thirty-two patients were recruited to this study. Twenty-four hours before PD, patients of group "A"

were submitted to HBO session while patients of group "B" breathed air in an hyperbaric chamber pressurized to 1.15 ATA (placebo procedure). In all patients, blood was taken before (T0) and at the end HBO session or placebo procedure (T1), in the first post-operative day (T2) and in the seventh post-operative day (T3). It was used to measure IL-1, IL-6, IL-8, IL-10, IL-12p70 and TNF- α . For the evaluation of the post-operative outcome we considered the presence of postoperative pancreatic fistula (POPF), biliary fistula, fever, intra-abdominal collections, bleeding, pulmonary complications, delay gastric empty and the use of postoperative antibiotics. **Result** Significant differences in favor of HBO group were found regarding the pulmonary complications (none in HBO group versus 6 in the placebo group; $P=0.023$). The maximum concentration of cytokines is in T2 and HBO exposure can modulate the concentration of IL-6 and IL-10 ($P=0.009$ and $P=0.030$ HBO vs. placebo). **Conclusions** Preliminary data suggest that preconditioning hyperbaric oxygen therapy is safe and can be applied to all patients after careful clinical evaluation and identification of absolute contraindications with a potential role in decreasing the pulmonary complications.