

Hyperbaric oxygen and lymphoid system function: A review supporting possible intervention in tissue transplantation

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Abstract.

This review addresses the many ways that hyperbaric oxygen (HBO₂) has been found to mitigate immune reactions, many of which are involved in rejection of allograft transplants, and thus offers a rationale for its possible use as an adjunct to help preserve and protect transplanted tissues. Rejection may involve both immunological reactions of the lymphoid system, or lymphoid-independent damage from trauma or other factors, including reperfusion injury. Lymphoid-induced damage involves cellular elements such as CD4 and macrophage cell types, as well as both proinflammatory and inhibitory cytokines. Cytokines such as TNFs and interleukins activate T-cells and macrophages, resulting in endothelial damage and its consequences. The immunosuppressive effects of HBO₂ include suppression of autoimmune symptoms, decreased production of IL-1 and CD4 cells, and increased percentage and absolute number of CD8 cells. HBO₂ normalizes cell-bound immunity and decreases the serum concentration of immune complexes. Studies have shown MHC class I expression to be altered when cultures were exposed to HBO₂, so as to become undetectable by monoclonal antibodies or cytotoxic T lymphocytes. HBO₂ has been used in support of replanted rabbit ear grafts, spinal cord tissue transplants, dislocated young permanent teeth in children, replanting of fingers, free fibula reconstruction of segmental mandibular resections, autogenous free bone grafts, transplantations of the cornea, and liver transplants. In addition to its specific effects on the immune system, HBO₂ improves tissue oxygenation, reduces free radical damage during reperfusion, maintains marginally ischemic tissue, and accelerates wound healing. These properties make HBO₂ a promising intervention to be tested in transplantation recipients.