Effects of hyperbaric oxygen and platelet derived growth factor on medial collateral ligament fibroblasts.

Chan YS, Chen AC, Yuan LJ, Lin SS, Yang CY, Lee MS, Ueng SW.

Department of Orthopaedic Surgery and Hyperbaric Oxygen Therapy Center, Chang Gung Memorial Hospital and Chang Gung University College of Medicine, 5, Fu-Hsing St. 333, Kweishan, Taoyuan, Taiwan.

Abstract

PURPOSE: This study investigated hyperbaric oxygen (HBO2) and platelet-derived growth factor-BB (PDGF-BB) to determine their combined effects on fibroblasts from rabbit medial collateral ligament (MCL).

METHOD: Cells were divided into four groups: (I) Control, (II) HBO2 treatment, (III) PDGF-BB treatment and (IV) HBO2 combined with PDGF-BB treatment. All hyperoxic cells were exposed to 100% O2 at 2.5 atmospheres absolute (ATA) in a hyperbaric chamber for 120 minutes per 48 hours. Measurement of cell growth was based on increase in cell number. Cell cycle modulations were analyzed by fluorescence-activated cell sorter (FACS). Quantity of Type I and Type III collagen was determined by western blotting and image analyzer.

RESULTS: Treatment doses of HBO2 alone or PDGF-bb alone dependently increased cell growth. A combination of HBO2 treatment plus PDGF-bb treatment had an additive effect on cell growth in comparison with HBO2 treatment alone or PDGF-bb treatment alone. FACS analysis revealed that HBO2 alone, PDGF-bb alone and PDGF-bb plus HBO2 treatment increase the percentage of cells accumulated in S-phase. Western blotting analysis revealed that Type III collagen content was decreased significantly after HBO2 treatment alone or HBO2 plus PDGF-bb treatment but not in PDGF-bb treatment alone. In contrast, although Type I collagen content was increased after HBO2 treatment, the increase in Type I collagen (increase/original) was not statistically significant.

CONCLUSION: HBO2 or HBO2 plus PDGF-bb treatment decreases the Type III collagen/Type I collagen content, which could result in mechanically stronger collagen fibrils. We propose HBO2 therapy as a potentially effective treatment for MCL healing.

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