

Animal Model for Evaluating Bone Repair with and without Adjunctive Hyperbaric Oxygen Therapy (HBO)

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Abstract

The effect of hyperbaric oxygen (HBO) on the healing of standardized metaphyseal defects in the cortices of rat femurs was studied. The question was whether a known total amount of HBO given twice a day (BID) would have a different effect than once a day (QD) treatments. A microvascular casting technique was developed whereby vessel ingrowth at the repair site could be monitored using scanning electron microscopy (SEM). Bone repair morphology was evaluated by light microscopy (LM) and various tissue components were quantified by histomorphometry (HM). Animals were sacrificed 1, 2, 3, or 5 weeks postoperatively. SEM revealed that endosteal bone ingrowth was totally responsible for the repair of the cortical defects. Moreover, endosteal vessel ingrowth did not differ between controls and either group of HBO treated animals. LM displayed enchondral ossification in controls and BID treated animals and a pronounced osteoclastic activity in the latter group throughout the repair process. By contrast the QD treated group healed by primary ossification. Judged by the HM data, QD treatment appeared to accelerate bone repair and vessel ingrowth compared to controls, while BID treatment seemed to retard these processes

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