

EP-125

근막절제술을 시행받은 구획증후군-유발 랫드에서 고압산소치료의 효용성

(Efficacy of Hyperbaric Oxygen Therapy Post-Fasciotomy for Acute Compartment Syndrome in a Rat Model)



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Purpose: Acute compartment syndrome (ACS) is a medical emergency where delayed fasciotomy often leads to permanent muscle damage. While hyperbaric oxygen therapy (HBOT) is an approved adjunctive treatment, its molecular mechanisms and efficacy when applied specifically during the reperfusion period post-fasciotomy are not fully elucidated.

Methods: Twelve Sprague-Dawley rats were divided into HBO and control groups. ACS was induced via hind limb cuff compression (120–140 mmHg) for 3 hours. Fasciotomy was performed 24 hours post-injury. The HBO group received 100% oxygen at 2.5 ATA for 2 hours daily for 5 consecutive days starting immediately post-fasciotomy. Muscle tissues were harvested 7 days after therapy for histological (Masson's trichrome) and molecular (qPCR, Western blot, IHC) analysis.

Results: The HBO group showed markedly reduced collagen deposition compared to the control group. Furthermore, the HBO group exhibited significantly lower numbers of Pax7-positive cells (p value = 0.026), reduced VEGF-A protein expression (p value = 0.01), and fewer CD31-positive capillaries (p value = 0.04). No significant differences were observed in muscle weight or CD68-positive macrophage counts.

Conclusion: HBOT applied during the reperfusion phase post-fasciotomy appears to accelerate the muscle regeneration process. The reduction in early-phase regeneration markers (Pax7, VEGF-A) and fibrosis suggests that HBOT facilitates a faster transition toward tissue maturation, potentially improving clinical outcomes in cases of delayed fasciotomy.



Fig. 1. Gross picture of Rat Model with Induced Acute Compartment Syndrome

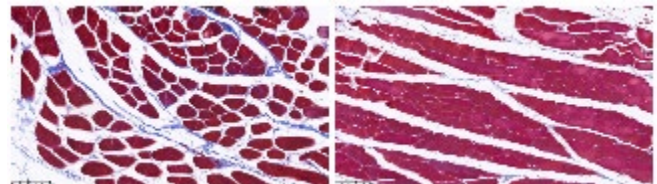


Fig. 2. Histopathological Analysis of Muscle Fibrosis. Masson's trichrome staining of the tibialis anterior (TA) muscle. (Left) The control group shows increased collagen deposition (blue staining).

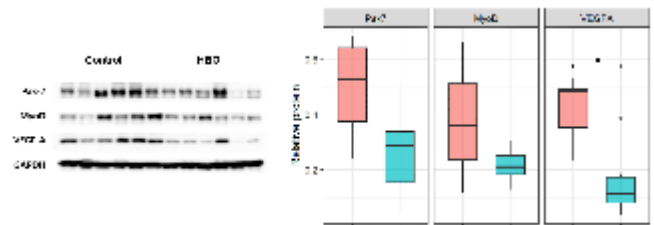


Fig. 3. Protein Expression of Myogenic and Angiogenic Markers : Western blot and quantitative analysis of Pax7, MyoD, and VEGF-A.