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Therapeutic Effects of Ozone Therapy on Experimental Fracture Healing in the Rabbit Model

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Abstract

Fracture repair is a complex biological process that requires the cooperation of various types of cells and materials. Today, various techniques such as low-density pulse ultrasonography and electrical stimulation are used to accelerate bone healing. The therapeutic effects of ozone on bone repair have been considered in recent years. The purpose of this study was to evaluate the effect of ozone gas on the speed of full-thickness bone defect healing. We selected 30 male weight equal rabbits and, in aseptic surgery, resected a 3-mm-thick piece of full-thickness of bone. Then we divided randomly them into two equal groups, the control, and the recipient. In the first, second, third, and sixth weeks of the radiographed bones were obtained. Also, in the third, sixth, and eighth weeks of each group, 5 rabbits were euthanized and their bones were histopathologically evaluated. Results from the second to sixth weeks of the study showed a significant difference between the treatment group and the control group. This difference was indicative of an increase in the rate of bone healing in the treatment group. Ozone therapy can therefore be considered effective in bone healing.

Keywords: Ozone therapy, Bone healing, Rabbit, Radius

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Refrences

Andreula, C. (2011). Ozone therapy. *Neuroradiology, 53*(1), 207.

Bigham, A. S., Dehghani, S. N., Shafiei, Z., & Nezhad, S. T. (2008). Xenogenic demineralized bone matrix and fresh autogenous cortical bone effects on experimental bone healing: radiological, histopathological and biomechanical evaluation. *Journal of Orthopaedics and Traumatology, 9*(2), 73-80.

Bocci, V. (2011). Ozone. A new medical drug 2nd Ed. In: Dordrecht, The Netherlands: Springer Publ

Bocci, V. (2013). *Oxygen-ozone therapy: a critical evaluation*: Springer Science & Business Media.

Bocci, V., & Di Paolo, N. (2009). Oxygen-ozone therapy in medicine: an update. *Blood purification, 28*(4), 373-376.

Bocci, V., Valacchi, G., Corradeschi, F., & Fanetti, G. (1998). Studies on the biological effects of ozone: 8. Effects on the total antioxidant status and on interleukin-8 production. *Mediators of Inflammation, 7*(5), 313-317.

Bocci, V., Zanardi, I., & Travagli, V. (2011). Ozone: a new medical drug in vascular diseases. *Am J Cardiovasc Drugs, 11*(2), 73-82.

Duman, I. G., Davul, S., Gokce, H., Gonenci,R., Özden, R., & Uruc, V. (2017). Effects of gaseous ozone treatment on bone regeneration in femoral defect model in rats. *Journal of Hard Tissue Biology, 26*(1), 7-12.

Garcia, V. G., Da Conceição, J. M., Fernandes, L. A., de Almeida, J. M., Nagata, M. J. H., Bosco, A. F., & Theodoro, L. H. (2013). Effects of LLLT in combination with bisphosphonate on bone healing in critical size defects: a histological and histometric

study in rat calvaria. *Lasers in medical science, 28*(2), 407-414.

Gist, S., Tio-Matos, I., Falzgraf, S., Cameron, S., & Beebe, M. (2009). Wound care in the geriatric client. *Clinical interventions in aging, 4*, 269.

Hubert, Chang., A.M. Elvis. (2012). Oxidative consumption of oral biomolecules by therapeutically-relevant doses of ozone Adv Chem Eng Sci, 2 pp. 238-245.

Irban, A., Uslu, S., Gereli, A., Ilgaz, E., Aydinlar, P. E., Karyemez, N. L., & Suyen, G. G. (2015). The effect of ozone therapy on experimental bone fracture healing in rats. *Int Res J Public Environ Health, 2*(10), 159-166.

Karimi, I., Bigham-Sadegh, A., Oryan, A., & Dowlat Abadi, M. (2013). Concurrent use of greater omentum with Persian Gulf coral on bone healing in dog: a radiological and histopathological study. *Iranian Journal of Veterinary Surgery, 8*(2), 35-42.

Kim, H. S., Noh, S. U., Han, Y. W., Kim, K. M., Kang, H., Kim, H. O., & Park, Y. M. (2009). Therapeutic effects of topical application of ozone on acute cutaneous wound healing. *Journal of Korean medical science, 24*(3), 368-374.

Laçin, N., Kaya, B., Deveci, E., Kadiroğlu, E. T., Aktaş, A., Yalçin, M., & Uysal, E. (2018). Comparative evaluation of ozone treatment in critical size bone defects reconstructed with alloplastic bone grafts. *International Journal of Clinical Medicine, 9*(07), 566.

Monte, A. D., Der Zee, H. V., & Bocci, V. (2005). Major ozonated autohemotherapy in chronic limb ischemia with ulcerations. *Journal of Alternative & Complementary Medicine, 11*(2), 363-367.

Oryan, A., Moshiri, A., & Meimandiparizi, A.-H. (2011). Effects of sodium-hyaluronate and glucosamine-chondroitin sulfate on remodeling stage of tenotomized superficial digital flexor tendon in rabbits: a clinical, histopathological, ultrastructural, and biomechanical study. *Connective tissue research, 52*(4), 329-339.

Ozdemir, H., Toker, H., Balcı, H., & Ozer, H. (2013). Effect of ozone therapy on autogenous bone graft healing in calvarial defects: a histologic and histometric study in rats. *Journal of periodontal research, 48*(6), 722-726.

Sagai, M., & Bocci, V. (2011). Mechanisms of action involved in ozone therapy: is healing induced via a mild oxidative stress? *Medical gas research, 1*(1), 29.

Verhaar, H. J., & Lems, W. F. (2010). PTH analogues and osteoporotic fractures. *Expert opinion on biological therapy, 10*(9), 1387-1394.

Vos, D. I., Verhofstad, M. H., Hanson, B., van der Graaf, Y., & van der Werken, C. (2012). Clinical outcome of implant removal after fracture healing. Design of a prospective multicentre clinical cohort study. *BMC musculoskeletal disorders, 13*(1), 147.

Zhang, J., Guan, M., Xie, C., Luo, X., Zhang, Q., & Xue, Y. (2014). Increased growth factors play a role in wound healing promoted by noninvasive oxygen-ozone therapy in diabetic patients with foot ulcers. *Oxidative* medicine and cellular longevity.