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Design and fabrication of Helmholtz coils to study the effects of pulsed electromagnetic fields on enhancing the healing process in periodontitis

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Effects of electromagnetic fields on healing have been investigated for centuries. Substantial data indicates that exposure to electromagnetic fields can lead to enhanced healing in soft and hard tissues. Helmholtz coils are devices that generate pulsed electromagnetic fields (PEMF). In this work, two identical pairs of Helmholtz coils were designed and fabricated to enhance the healing process in periodontitis. Identical pairs of square Helmholtz coils generated the 50 Hz magnetic field. Forty (40) male rats were purchased and randomly divided into four groups (G1: exposure and ligature, G2: ligature only, G3: exposure only and G4: control group). Periodontitis was induced by ligating 3-0 silk suture around 2nd left molars. After 14 days, rats were exposed to PEMFs for seven days. In the next stage, the microscopic slides were prepared for histopathological explorations. The Helmholtz coils generated a uniform magnetic field between their coils. The magnetic field strength at the center of the space between two coils was $97 \pm 2 \mu\text{T}$. The mean periodontitis score in “exposure and ligature” group was significantly lower than that of the “ligature only” group. Comparison of the means of “exposure only” group and “control group” (no ligature, no exposure group) could not show any statistically significant difference. Comparison of the mean scores of the test and control groups indicates periodontitis can be reduced in animals exposed to PEMFs after ligature. Considering the mean scores of the groups two and four, exposure to PEMFs in “exposure only” group was unable to make any changes in the intact tissues.

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