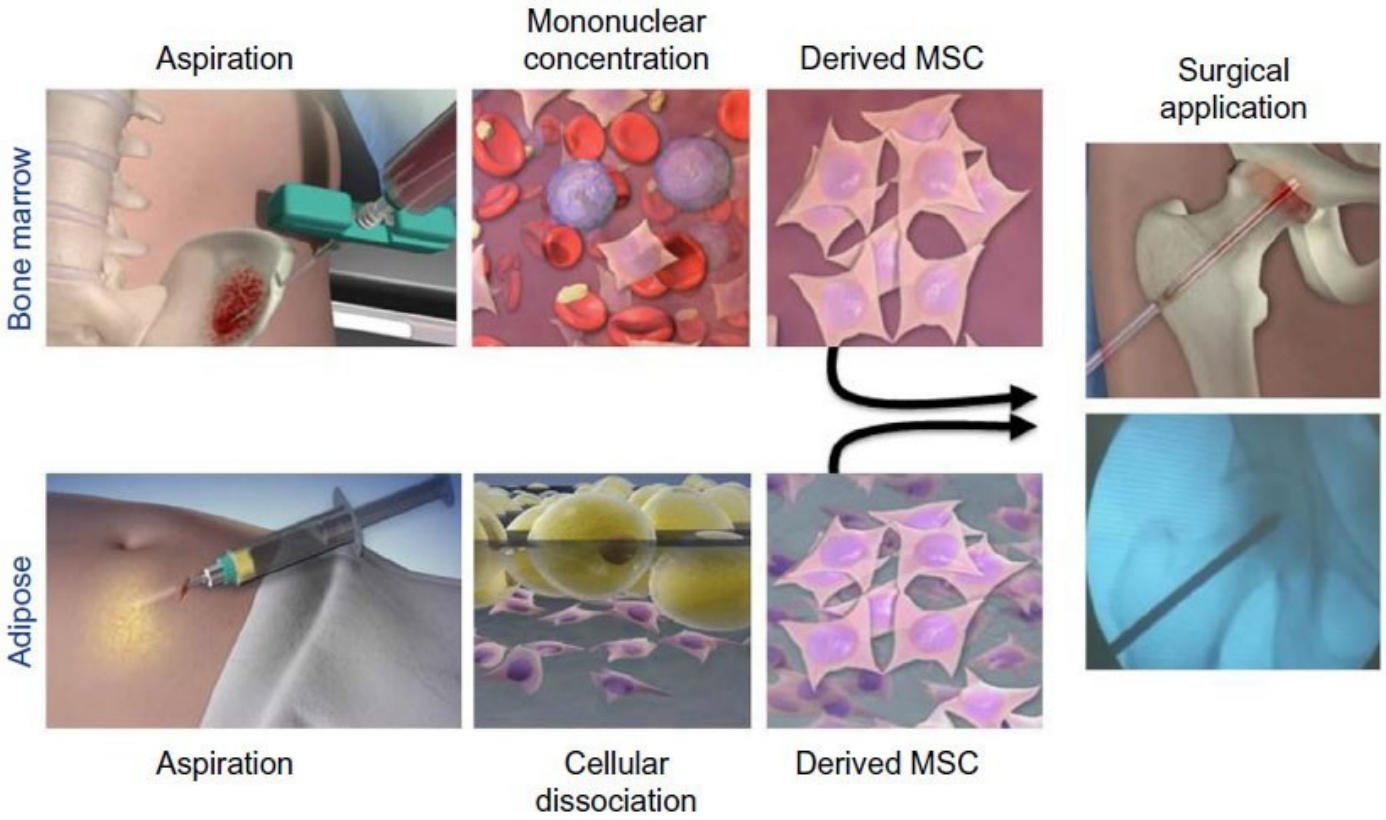
Medical PEMF Studies

cell2n
Innovative Cellular Healing

WOUND HEALING

Pulsed electromagnetic fields stimulate osteogenic differentiation in human bone marrow and adipose tissue derived mesenchymal stem cells.



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Pulsed electromagnetic fields (PEMFs) play a regulatory role on osteoblast activity and are clinically beneficial during fracture healing. Human mesenchymal stem cells (MSCs) derived from different sources have been extensively used in bone tissue engineering. Compared with MSCs isolated from bone marrow (BMSCs), those derived from adipose tissue (ASCs) are easier to obtain and available in larger amounts, although they show a less osteogenic differentiation potential than BMSCs. The hypothesis tested in this study was to evaluate whether PEMFs favor osteogenic differentiation both in BMSCs and in ASCs and to compare the role of PEMFs alone and in combination with the biochemical osteogenic stimulus bone morphogenetic protein (BMP)-2. Early and later osteogenic markers, such as alkaline phosphatase (ALP) activity, osteocalcin levels, and matrix mineralization, were analyzed at different times during osteogenic differentiation. Results showed that PEMFs induced osteogenic differentiation by increasing ALP activity, osteocalcin, and matrix mineralization in both BMSCs and ASCs, suggesting that PEMF activity is maintained during the whole differentiation period. The addition of BMP-2 in PEMF exposed cultures further increased all the osteogenic markers in BMSCs, while in ASCs, the stimulatory role of PEMFs was independent of BMP-2. Our results indicate that PEMFs may stimulate an early osteogenic induction in both BMSCs and ASCs and they suggest PEMFs as a bioactive factor to enhance the osteogenesis of ASCs, which are an attractive cell source for clinical applications. In conclusion, PEMFs may be considered a possible tool to improve autologous cell-based regeneration of bone defects in orthopedics.

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