



Bone

This review article makes the following observations with respect to the use of pulsed electromagnetic fields in treating ununited fractures, failed arthrodeses, and congenital pseudarthroses. The treatment has been shown to be more than 90 percent effective in adult patients. In cases where union does not occur with PEMFs alone after approximately four months, PEMF treatment coupled with fresh bone grafts ensures a maximum failure rate of only 1 to 1.5 percent. For those with delayed union three to four months following fracture, PEMFs appear to be more successful than in patients treated with other conservative methods. For more serious conditions, including infected nonunions, multiple surgical failures, long-standing atrophic lesions, failed knee arthrodeses after removal of infected prostheses, and congenital pseudarthroses, PEMF treatment has exhibited success in most patients. **(1)**

Results of this study found that 35 of 44 nonunited scaphoid fractures 6 months or older healed in a mean time of 4.3 months during pulsed electromagnetic field treatment using external coils and a thumb spica cast. **(2)**

This double-blind, placebo-controlled study examined the effects of pulsed electromagnetic fields in femoral neck fracture patients undergoing conventional therapy. PEMF treatment was started within two weeks of fracture, and patients were instructed to make use of the electromagnetic device for 8 hours per day over a 90-day period. Results showed beneficial effects relative to controls after 18 months of follow-up. **(3)**

Results of this double-blind study showed significant healing effects of low-frequency pulsing electromagnetic fields in patients treated with femoral intertrochanteric osteotomy for hip degenerative arthritis. **(4)**

In this study, 147 patients with fractures of the tibia, femur, and humerus who had failed to benefit from surgery-received treatment with external skeletal fixation in situ and pulsed electromagnetic fields. Results indicated an overall success rate of 73 percent. Femur union was seen in 81 percent and tibia union in 75 percent. **(5)**

This study examined the effects of extremely low frequency electromagnetic fields (1-1000 Hz, 4 gauss) on new bone fractures of female patients. Results led the authors to suggest that EMF treatment accelerates the early stages of fracture healing. **(6)**

This study examined the preventive effects of low-frequency pulsing electromagnetic fields against delayed union in rat fibular osteotomies and diaphyseal tibia fractures in humans. Results indicated such treatment modulated and accelerated fracture union in both groups. **(7)**

This article discusses the cases of two children with bone malunion following lengthening of congenitally shortened lower legs. Pulsed sinusoidal magnetic field treatment was beneficial for both patients. **(8)**

Results of this study showed that 13 of 15 cases of long bone nonunion treated with pulsed electromagnetic fields in combination with Denham external fixator united within several months. **(9)**

Results of this study found electromagnetic field stimulation to be an effective treatment for nonunion among a group of 37 French. **(10)**

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Results of this study found treatment induced pulsing to be beneficial in patients suffering from nonunions unresponsive to surgery. **(11)**

In this interview with Dr. C. Andrew L. Bassett, a physician researching the use of pulsed electromagnetic fields for the past 30 years at Columbia University's Orthopedic Research Lab, Dr. Bassett notes that approximately 10,000 of the 12,000-plus orthopedic surgeons in the U.S. have used pulsed electromagnetic fields on at least one patient. Many such surgeons have incorporated the therapy on a more regular basis. He estimates that a total of at least 65,000 patients nationwide have received the treatment, with a probable success rate of between 80 and 90 percent. Use of the treatment has been primarily in patients suffering from nonunited fractures, fusion failures, and pseudoarthrosis. **(12)**

Results of this study showed pulsed electromagnetic fields to have beneficial healing effects in patients suffering from difficult to treat and surgically resistant bone nonunions. This review article notes that the use of pulsed electromagnetic fields began in 1974, and that 250,000 nonunion patients have received the treatment since. The author argues that success rates are comparable to those of bone grafting, and that PEMF treatment is more cost-effective and free of side effects. The FDA approved PEMF use in 1982, although it remains widely unused due to physician misunderstanding and lack of knowledge concerning the treatment. **(13)**

This 7-year study examined data on more than 11,000 cases of nonunions treated with pulsed electromagnetic fields for up to 10 to 12 hours per day. Results indicated an overall success rate of 75 percent. **(14)**

This study examined the effects of low-frequency electromagnetic fields (1-1000 Hz) on middle-aged female patients suffering from fresh radius fractures. Results showed significant increases in scintimetric activity surrounding the fracture area after two weeks of EMF treatment relative to controls. **(15)**

This study examined the effects of constant magnetic fields in patients suffering from fractures. Results showed that magnetic exposure reduced pain and the onset of edema shortly after trauma. Where edema was already present, the treatment exhibited marked anti-inflammatory effects. The strongest beneficial effects occurred in patients suffering from fractures of the ankle joints. **(16)**

Results of this study found that 10 hours per day of electromagnetic stimulation (1.0-1.5 mV) produced complete union in 23 of 26 patients receiving the treatment for non-joined fractures. **(17)**

This review article looks at the history of pulsed electromagnetic fields as a means of bone repair. The author argues that success rates have been either superior or equivalent to those of surgery, with PEMF free of side effects and risk. **(18)**

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Bone (Cont.)

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