Microcirculatory effects of pulsed electromagnetic fields.

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PURPOSE: Pulsed electromagnetic fields (PEMF) are used clinically to expedite healing of fracture non-unions, however, the mechanism of action by which PEMF stimulation is effective is unknown. The current study examined the acute effects of PEMF stimulation on arteriolar microvessel diameters in the rat cremaster muscle. The study hypothesis was that PEMF would increase arteriolar diameters, a potential mechanism involved in the healing process. METHODS: Local PEMF stimulation/sham stimulation of 2 or 60 min duration was delivered to the cremaster muscle of anesthetized rats. Arteriolar diameters were measured before and after stimulation/sham stimulation using intravital microscopy. Systemic hemodynamics also were monitored during PEMF stimulation. RESULTS: Local PEMF stimulation produced significant (p<0.001) vasodilation, compared to pre-stimulation values, in cremasteric arterioles in anesthetized rats (n=24). This dilation occurred after 2 min of stimulation (9% diameter increase) and after 1 h of stimulation (8.7% diameter increase). Rats receiving "sham" stimulation (n=15) demonstrated no statistically significant change in arteriolar diameter following either "sham" stimulation period. PEMF stimulation of the cremaster (n=4 rats) did not affect systemic arterial pressure or heart rate, nor was it associated with a change in tissue environmental temperature. CONCLUSIONS: These results support the hypothesis that local application of a specific PEMF waveform can elicit significant arteriolar vasodilation. Systemic hemodynamics and environmental temperature could not account for the observed microvascular responses.

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