Biological Mechanism of Shockwave in Fracture Healing

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The purpose of this study was to investigate the biological mechanism of shock wave treatment in bone healing in rabbits.
A closed fracture of the right femur was created with a three-point bend method and the fracture was stabilized with an intra-medullary pin. Shock waves were applied one week after the fracture. Twenty-four New Zealand white rabbits were randomly divided into three groups. Group 1 (the control) received no shock waves; group 2 received low-energy and group 3 high-energy shock waves. The animals were sacrificed at 24 weeks, and a 5-cm segment of the femur bone including the callus was harvested. The specimens were studied with histomorphological examination, biomechanical analysis and immunohistochemical stains.
The results showed that high-energy shockwaves improved bone healing with significant increase in cortical bone formation and the number of neovascularization in histomorphology, better bone strength and bone mass in biomechanics, and increased expressions of angiogenic growth markers including BMP-2, eNOS, VEGF and PCNA than the control and low-energy shock wave groups. The effect of shock wave treatment appears to be dose-dependent. In conclusion, high-energy shock waves promote bone healing associated with ingrowth of neovascularization and increased expressions of angiogenic growth factors.