[New bone formation by extracorporeal shock waves. Dependence of induction on energy flux density]

BACKGROUND: The purpose of this study was to test the hypothesis that shock waves can induce new bone formation even without cortical fractures and periosteal detachment as suggested in the literature.

METHODS: Extracorporeal shock waves with energy flux densities between 0 mJ/mm\(^2\) (sham treatment) and 1.2 mJ/mm\(^2\) were applied in vivo to the distal femoral region of rabbits (1500 pulses at 1 Hz frequency each). Oxytetracycline was injected on days 5-9 and the animals were sacrificed on day 10. Sections of both femora of all animals were investigated with broadband fluorescence microscopy and contact microradiography for new periosteal and endosteal bone, periosteal detachment, cortical fractures, and trabecular bone with callus.

RESULTS: Shock waves with energy flux densities of 0.9 mJ/mm\(^2\) and 1.2 mJ/mm\(^2\) resulted in new periosteal bone formation in the presence of cortical fractures and periosteal detachment. After application of shock waves with energy flux density of 0.5 mJ/mm\(^2\), clearly detectable signs of new periosteal bone formation were observed without cortical fractures or periosteal detachment.

CONCLUSIONS: The results of this study challenge the current view in the literature that the creation of cortical fractures and periosteal detachment are prerequisites for new bone formation mediated by extracorporeal shock waves.
shock waves.

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