The aim of this study was to investigate if radial extracorporeal shock wave therapy (rESWT) induces new bone formation and to study the time course of ESWT-induced osteogenesis. A total of 4000 impulses of radial shock waves (0.16 mJ/mm²) were applied to one hind leg of 13 New Zealand white rabbits with the contralateral side used for control. Treatment was repeated after 7 days. Fluorochrome sequence labeling of new bone formation was performed by subcutaneous injection of tetracycline, calcein green, alizarin red and calcein blue. Animals were sacrificed 2 weeks (n = 4), 4 weeks (n = 4) and 6 weeks (n = 5) after the first rESWT and bone sections were analyzed by fluorescence microscopy. Deposits of fluorochromes were classified and analyzed for significance with the Fisher exact test. rESWT significantly increased new bone formation at all time points over the 6-week study period. Intensity of ossification reached a peak after 4 weeks and declined at the end of the study. New bone formation was significantly higher and persisted longer at the ventral cortex, which was located in the direction to the shock wave device, compared with the dorsal cortex, emphasizing the dose-dependent process of ESWT-induced osteogenesis. No traumata, such as hemorrhage, periosteal detachment or microfractures, were observed by
histologic and radiologic assessment. This is the first study demonstrating low-energy radial shock waves to induce new bone formation in vivo. Based on our results, repetition of ESWT in 6-week intervals can be recommended. Application to bone regions at increased fracture risk (e.g., in osteoporosis) are possible clinical indications.