Abstract:
Cefuroxime is widely used for antibiotic prophylaxis in orthopedic surgery. However, a recent study indicated a dose-dependent reduction in osteoblast function in vitro. Nevertheless, cell culture might not sufficiently imitate the complex process of bone remodeling. As data concerning possible in vivo interactions of cefuroxime on fracture healing are completely missing, we investigated the following hypothesis: Does Cefuroxime impair bone healing in vivo? Therefore, 34 male Wistar rats were randomised to cefuroxime-treated or control groups, a Kirschner wire was inserted into right femora and closed transverse fractures were produced. Twenty-one days later, the structural properties of the fracture callus in the early fracture healing phase were evaluated via a combination of micro-CT (µCT), biomechanics and histology. µCT demonstrated similar values in the cefuroxime and control group (e.g., callus volume: 67.19 ± 14.90 mm\(^3\) vs. 55.35 ± 6.74 mm\(^3\), p = 0.12; density: 635.48 ± 14.81 mg HA/cm\(^3\) vs. 647.87 ± 13.01 mg HA/cm\(^3\), p = 0.16). Biomechanically, similar values were again determined between the groups, in terms of both maximum load (77.65 ± 41.82 vs. 78.54 ± 20.52, p = 0.95) and stiffness (122.44 ± 81.16 vs. 123.74 ± 60.08, p = 0.97).
Histological findings were consistent with the radiographic results. Thus, no relevant differences between the cefuroxime and control groups could be found and the reported negative effects on osteoblasts in vitro were not confirmed in vivo by using standard concentrations of cefuroxime. In conclusion, cefuroxime can reasonably be recommended in a clinical setting as an antibiotic therapy when fracture healing is involved. However, supraphysiological doses were not evaluated, which may be present when cefuroxime is used as an additive to bone cement and released over time. Therefore, future studies should evaluate the in vivo effects of prolonged high cefuroxime doses on implant incorporation. © 2016 Wiley Periodicals, Inc. J Biomed Mater Res Part B: Appl Biomater, 105B: 2282-2291, 2017.