

Residual Strength and Microdamage of Cortical Bone After Non-Destructive Creep Loading

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Abstract: Bone tissue is a viscoelastic material which shows time-dependent mechanical manner. Moreover, it is known that bone microdamage is generated by physiological normal mechanical loading in vivo [1-3]. In order to know basic insight into the adverse effects of creep loading on bone strength, in the present study, we focused on the mechanical behavior of cortical bone after non-destructive creep loading at high stress magnitude. Cylindrical specimens were obtained from cortical bone in the longitudinal and tangential direction of bovine femur. We statically applied a compressive stress to the specimens (creep group) for 24 hours. The specimens without creep loading were used to obtain the data on the intact cortical bone (control group). Micro-Vickers hardness tests were conducted for the specimens in the control and creep groups. X-ray micro CT analyses were performed to detect bone microdamage. The hardness in the creep group was lower than that in the control group. Furthermore, X-ray micro CT analyses demonstrated that there existed bone microdamage mainly at the outer portion of the specimen in the creep group. These results indicate that bone microdamage was induced by the creep loading.

Keywords: Bone; Creep loading; Residual strength; Microdamage

References

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