

Abstract

Microindentation on healing fractures: A comparison between healthy and osteoporotic bone

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Osteoporotic fracture healing is a relatively unexplored field, but nevertheless fractures caused by osteoporosis is a growing problem with an aging population. When investigating the quality of newly formed bone during healing, bone geometry and density measurements together with three point bending is typically featured. Hardness of the newly formed bone is suggested as an additional perspective to evaluate the quality of the healing fractures and can be measured on a structural level using microindentation. There is however no standard for measuring hardness on bone using microindentation. The aim of this study was to establish a local protocol for microindentation on bone using the Knoop indenter. A possible difference in hardness between healthy and osteoporotic bone was investigated as well as if there is a difference in hardness between the newly formed callus bone and cortical bone. An open fracture model on rat femur was used on healthy and osteoporotic rats. The model of osteoporosis was an ovariectomized (OVX) rat model. The samples was embedded in plastic and cut in half by a diamond blade saw. Methods for improving the bone surface was investigated. The optimal load for the microindentation was examined and chosen as 25g. Hardness measurements was performed on the cortical bone and the callus on both the healthy and osteoporotic bone. Within the project, a protocol for successful measurements was established. The results indicate that the callus is softer than the cortical bone but no significant difference in hardness between the healthy and osteoporotic bone could be seen.



Figure 1: Representative indentation on cortical bone.