Osteoarthritis alters the patellar bones subchondral trabecular architecture

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Following the principles of ”morphology reveals biomechanics,” the cartilage-osseous interface and the trabecular network show defined adaptation in response to physiological loading. In the case of a compromised relationship, the ability to support the load diminishes and the onset of osteoarthritis (OA) may arise. To describe and quantify the changes within the subchondral bone plate (SBP) and trabecular architecture, 10 human OA patellae were investigated by CT and micro-CT. The results are presented in comparison to a previously published dataset of 10 non-OA patellae which were evaluated in the same manner. The analyzed OA samples showed no distinctive mineralization pattern in regards to the physiological biomechanics, but a highly irregular disseminated distribution. In addition, no regularity in bone distribution and architecture across the trabecular network was found. We observed a decrease of material as the bone volume and trabecular thickness/number were significantly reduced. In comparison to non-OA samples, greatest differences for all parameters were found within the first mm of trabecular bone. The differences decreased toward the fifth mm in a logarithmic manner. The interpretation of the logarithmic relation leads to the conclusion that the main impact of OA on bony structures is located beneath the SBP and lessens with depth. In addition to the clear difference in material with approximately 12% less bone volume in the first mm in OA patellae, the architectural arrangement is more rod-like and isotropic, accounting for an architectural decrease in stability and support. (c) 2016 Orthopaedic Research Society. Published by Wiley Periodicals, Inc. J Orthop Res.
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