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Limited Associations between Keel Bone Damage and Bone Properties Measured with Computer Tomography, Three-Point Bending Test, and Analysis of Minerals in Swiss Laying Hens

Summary

Keel bone damage is a wide-spread welfare problem in laying hens. It is unclear so far whether bone quality relates to keel bone damage. The goal of the present study was to detect possible associations between keel bone damage and bone properties of intact and damaged keel bones and of tibias in end-of-lay hens raised in loose housing systems. Bones were palpated and examined by peripheral quantitative computer tomography (PQCT), a three-point bending test, and analyses of bone ash. Contrary to our expectations, PQCT revealed higher cortical and trabecular contents in fractured than in intact keel bones. This might be due to structural bone repair after fractures. Density measurements of cortical and trabecular tissues of keel bones did not differ between individuals with and without fractures. In the three-point bending test of the tibias, ultimate shear strength was significantly higher in birds with intact vs. fractured keel bones. Likewise, birds with intact or slightly deviated keel bones had higher mineral and calcium contents of the keel bone than birds with fractured keel bones. Calcium content in keel bones was correlated with calcium content in tibias. Although there were some associations between bone traits related to bone strength and keel bone damage, other factors such as stochastic events related to housing such as falls and collisions seem to be at least as important for the prevalence of keel bone damage.

Keywords: keel bone, laying hen, computer tomography, three-point bending, bone mineral content