Reconstructing the in vivo pressure distribution on the femur using inverse bone remodeling

**Background:** Inverse bone remodeling offers the possibility to reconstruct the loading history of a bone using the architecture of the bone alone, i.e. its outer shape as well as the internal trabecular morphology.

**Problem:** The resultant loading measured in vivo for the femur is tilted *anteriorly* (as shown in the figure below), which is also in agreement with inverse bone remodeling predictions using simplified loading conditions. However, the subchondral trabecular bone is particularly dense in the *posterior* region of the femoral head.

**Goal:** We speculate that the disagreement between resultant force and region of highest trabecular bone density is caused by the specific shape of the contact area and the inhomogeneous pressure distribution at the articular surface. The goal of this work is to investigate this hypothesis by computing the most likely pressure distribution acting on the femoral head using inverse bone remodeling.

Field: Numerical biomechanics

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