Response to Letter to the Editor, “Multiscale Analyses of the Bone-implant Interface”

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Implant failure represents an end-stage event, which can have an exceedingly complex etiology. Therefore, we were careful to restrict our conclusions to what the data demonstrated: namely, that compared with low insertion torque (IT), high IT creates high interfacial strain and induces more cell death, more osteoclast activity, and less new bone formation around an implant.

We (Cha et al. 2015), as well as Wang et al. (2014), recognize inherent limitations to quantifying microdamage in bone. As the latter wrote, “the limitation of this study was to count the complex microdamage as diffuse damage.” Nonetheless, we believe the message of our article is clear: high IT directly correlates with histologic evidence of microdamage.

Our finite element models did not involve axial loading; rather, all were formulated by defining radial movement of the screw threads into bone according to different misfit conditions attending the low and high IT situations. Due to space limitations, we plotted compressive principal strain magnitudes as a function of distance from the osteotomy. We felt that this accurately conveyed the point that interfacial strains were largest next to the implant surface and diminished with radial distance.

Finally, Tabassum et al. (2014) assessed the amount of bone around an implant 3 wk after placement (prior to osseointegration) in a goat model, while ours focused on the cellular and molecular responses to IT at multiple time points after implant placement. Despite radical differences in study design, both studies reached the same conclusion: low IT creates a more favorable environment for bone formation around an implant.

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