Influence of controlled immediate loading and implant design on peri-implant bone formation

Authors: Vandamme, Katleen; Naert, Ignace; Geris, Liesbet; Sloten, Jozef Vander; Puers, Robert; Duyck, Joke

Source: Journal of Clinical Periodontology, Volume 34, Number 2, February 2007, pp. 172-181(10)

Publisher: Blackwell Publishing

Abstract:


Abstract Aim: Tissue formation at the implant interface is known to be sensitive to mechanical stimuli. The aim of the study was to compare the bone formation around immediately loaded versus unloaded implants in two different implant macro-designs. Material and Methods: A repeated sampling bone chamber with a central implant was installed in the tibia of 10 rabbits. Highly controlled loading experiments were designed for a cylindrical (CL) and screw-shaped (SL) implant, while the unloaded screw-shaped (SU) implant served as a control. An F-statistic model with α=5% determined statistical significance. Results: A significantly higher bone area fraction was observed for SL compared with SU (p<0.0001). The mineralized bone fraction was the highest for SL and significantly different from SU (p<0.0001). The chance that osteoid- and bone-to-implant contact occurred was the highest for SL and significantly different from SU (p<0.0001), but not from CL. When bone-to-implant contact was observed, a loading (SL versus SU: p=0.0049) as well as an implant geometry effect (SL versus CL: p=0.01) was found, in favour of the SL condition. Conclusions: Well-controlled immediate implant loading accelerates tissue mineralization at the interface. Adequate bone stimulation via mechanical coupling may account for the larger bone response around the screw-type implant compared with the cylindrical implant.