IJAE Vol. 115, n. 1/2 (Supplement), 2010

Evaluation of thread pitch as a design key factor in dental implant osseointegration

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Long term success and predictability of endosseous dental implants in tooth replacement treatment have became a well documented outcome and are strictly related to initial mechanical stability as a crucial prerequisite in achieving osseointegration. Various factors (original bone density, implant surface topography, implant design) influence this stability and in the present research we investigated implant design because of its critical role, particularly in low density bone. The leading hypothesis is that selecting implant design features that maximize surface area available for contact may improve mechanical anchorage and primary stability in cancellous bone. We aimed to evaluate the role of implant thread pitch as a design key parameter on osseointegration process in poor bone density and limited availability of height by comparing two different implant profiles in an animal model. "Narrow pitch" implants (NP) with a 0.5 mm pitch and "wide pitch" implant (WP) with a 1.5 mm pitch were tested for osseointegration after 0 days, 4 and 8 weeks in a sheep iliac crest model. Biological investigations (histology and histomorphometry) as well as biomechanical tests (insertion/ removal torque test) have been performed. The data showed that initial mechanical anchorage and subsequent early endosseous integration in low density bone can be improved with a reduction of thread pitch. The greater surface area gained by decreasing thread pitch shows to increase bone to implant contact and primary stability since the implant placement. This better performance of NP profile can be appreciated even at early healing time when the subsequent biological integration results enhanced. In conclusion, these results confirm that, when primary stability is a concern, as in cancellous bone, increasing the implant surface area by using implants with smaller pitch may be beneficial.

Key words
Implant design, thread pitch, osseointegration