

Pagliani L, Motroni A, Nappo A & Sennerby L, 2010. 'Short Communication: Use of a Diagnostic Software to Predict Bone Density and Implant Stability in Preoperative CTs', Clin Implant Dent Relat Res [epub ahead of print]

Short Communication: Use of a Diagnostic Software to Predict Bone Density and Implant Stability in Preoperative CTs

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ABSTRACT

Background: Computerized tomographs (CTs) are commonly used for presurgical planning of dental implant placement. It is possible that implant stability can be predicted based on quantitative measurements of bone density at planned implants sites with the use of diagnostic software.

Purpose: The aim was to evaluate if there is a correlation between bone density measurements in specific implant positions in preoperative CTs and insertion torque (IT) and implant stability measurements when placing the implants.

Materials and Methods: The study comprised of four patients in whom presurgical CTs had been used to plan implant treatment. A total of 26 implants (Neoss, Harrogate, UK) were placed in the totally edentulous maxilla ($n = 3$) or mandible ($n = 1$). IT was measured during implant insertion and the torque/time curves examined for mean IT (newton-centimeters) over the total curve. The stability of implants was measured with resonance frequency analysis. The positions of the implants were extracted from a postoperative CT to the preoperative one. Bone density was measured with a dedicated software (3Diagnosys™ 3.0, 3Diemme, Cantù, Italy) in virtual hollow probes, indicating the bone volume within 1 mm from each implant surface. The Spearman Rank correlation test was used to find possible correlations.

Results: Statistically significant correlations were found between mean bone density, mean IT, and implant stability measurements.

Conclusions: This pilot study showed a correlation between bone density, as measured in Hounsfield units in preoperative CTs, and IT and implant stability measurements at the surgical placement of the implants. The findings support the idea that integration of bone density measurements in implant probes in preoperative CTs using treatment-planning software may be a useful feature to predict implant stability and to avoid failures.

KEY WORDS: dental implants, Hounsfield units, insertion torque measurements, radiography
