Cad/Cam Conic Crowns To Obtain A Predictable Retention In Implant Prosthesis: An In Vitro Study

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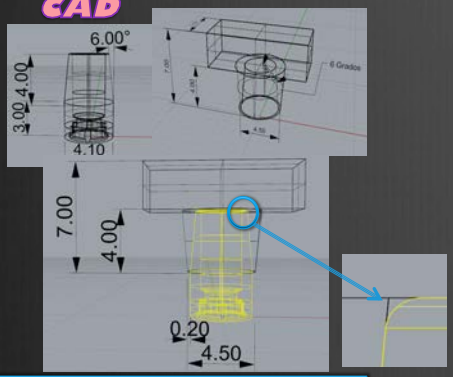
Aims

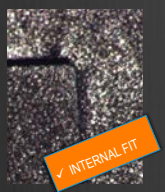
- ✓ Compare the retention strength of conic crowns CAD/CAM-designed and fabricated in fixed implant-supported prosthesis, depending on their cone angle.
- ✓ Build models to predict retention from cone angle and vice-versa in such crowns and initiate a line of research on implant-supported conic crown systems.

Material and methods

CAD



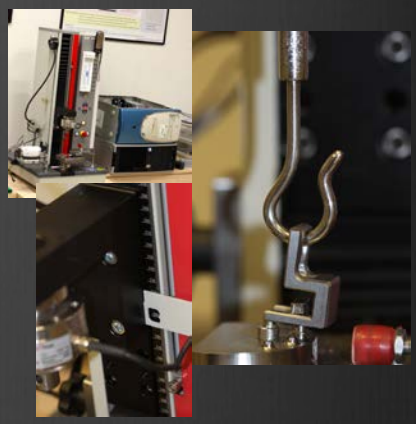
- ✓ Design with Rhinoceros v. 5.0 (McNeel & Associates, EE.UU.).
- ✓ *8 equal samples with the only difference of cone angle (1°-8°).*
- ✓ Intimate contact between surfaces.



CAM

- ✓ Milling strategy with CAM Sum3D v. 2.013.
- ✓ Titanium type V block (Zenotec Ti Disc, Wieland Dental, Alemania).
- ✓ Milling machine C20U (Hermle, Alemania).
- ✓ 5 specimens per cone angle. Total 40 especimens.

MEASUREMENTS



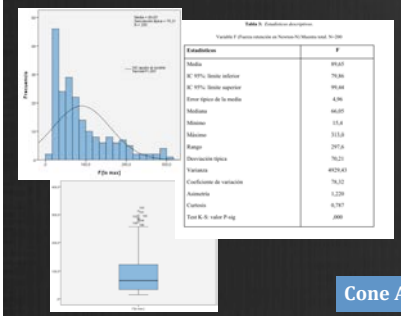
- ✓ Static testing machine Zwick/Roell BT1-FR2.5TS.D14 (nº serie 179392).
- ✓ *Tensile test. Measuring time of breaking matches with the separation of anchoring elements.*
- ✓ Preload 0,5N; Speed 1mm/min.
- ✓ 5 measurements in Newtons per specimen. Total 200.

Results

STATISTICAL ANALYSIS

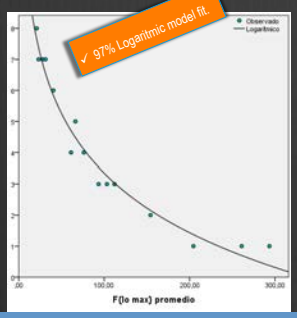
- ✓ Exploratory and descriptive analysis of quantitative variables with classic test of goodness of fit to the normal Gaussian model (Kolgomorov-Smirnov and Shapiro-Wilk).
- ✓ Box plots for the detection of outliers.
- ✓ Significance tests of mean difference.
- ✓ Anova test of multiple contrasts with a posteriori Tukey.
- ✓ Estimation of predictive regression models, estimating parameters, and goodness of fit R2.

- ✓ Categorical variable with 5 levels (specimen number).
- ✓ 2 quantitatives variables:
  - ✓ Dependent: Holding Force.
  - ✓ Independent: Angle cone.



RETENTION FORCE/ CONE ANGLE

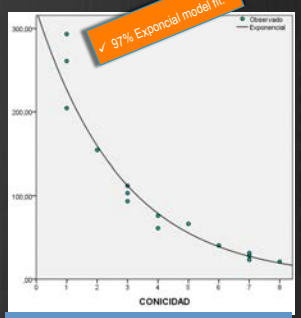
CONE ANGLE	RETENTION FORCE (N)
8°	21,02
7°	23,16 28,00 31,40
6°	40,46
5°	66,36
4°	61,23 76,12
3°	93,44 103,21 112,04
2°	154,20
1°	204,47 261,00 293,40



ANGLE FROM RETENTION

Cone Angle = 9,455 – 0,098 x F + 0,0004 x F – 5,4 x 10^{-7} x F

RETENTION FROM ANGLE



F = 322,235 X $e^{0,352 x Cone Angle}$

Conclusions

On the grounds of the present findings, and given the limitations inherent in the present in vitro study, the conclusions drawn were as follows: in conic crowns CAD/CAM-designed and manufactured in fixed implant-supported prostheses, the smaller the cone angle, the higher the retention strength; predictive models can be developed to obtain cone angle from retention strength and vice-versa; and lastly, this study initiates a promising line of research on implant-supported conic crown systems.