AIOP Poster Awards

The following are the three best scientific posters that were presented at the 27th International Congress of the Italian Academy of Prosthetic Dentistry held in Bologna on November 21 and 22, 2008.

Winner

Fracture Strength, Marginal Adaptation, and Gap Width of Different All-Ceramic Crown Systems

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Introduction: The aim of this study was to evaluate marginal gap, marginal adaptation before and after fatigue loading, and fracture strength of all-ceramic single crowns compared with metal-ceramic rehabilitation. ***Materials and Methods:*** Twenty-four premolars were endodontically treated and equally divided into three groups and restored with fiber posts (FRC Postec, Ivoclar Vivadent) luted with dual-curing composite resin cement (Multilink Automix, Ivoclar Vivadent). A composite build-up was realized using an adhesive bonding system (Adhese, Ivoclar Vivadent) and dual–curing composite (MultiCore HB, Ivoclar Vivadent). All teeth were prepared in a standardized manner: 2 mm of occlusal reduction, 1.5 mm of axial reduction, and a round shoulder 1.0-mm deep with 8 degrees of convergence placed coronal to the cementoenamel junction. Group I was restored with all-ceramic crowns fabricated with a zirconia core and pressable veneering ceramic (ZirCad/Zirpress, Ivoclar Vivadent). Group II was completely manufactured in lithium disilicate glass ceramic material (IPS E.max Press, Ivoclar Vivadent). Group III, the control group, was realized with a conventional framework in metal alloy (IPS D.sign 91, Ivoclar Vivadent) and pressable veneering ceramic (ZirPress, Ivoclar Vivadent). The luting was performed with a self-adhesive, dual-curing composite cement (Multilink Sprint, Ivoclar Vivadent). Thermocycling and mechanical loading (TCML) was made to simulate a 5-year period of oral service (parameters: 6,000 thermal cycles (5°C/55°C), 1.2×10^6 mastication cycles at 50 N using an artificial oral environment). After TCML the restorations were loaded in the axial direction under an angle of 135 degrees to failure in a universal testing machine (v = 1 mm min, Zwick 1446). Statistical analysis was performed using the Mann-Whitney and Tukey-Kramer tests at a $\alpha = 0.05$ significance level. ***Results:*** Before thermocycling and mechanical loading (TCML) 100.0% perfect margins were observed in group I and group II at both interfaces, crown-cement and tooth-cement. In group III the share of perfect margin was 81.6% at the cement-crown interface and 69.8% at the tooth-cement interface. After TCML, perfect margins for group I decreased to 91.3% (cement-crown interface) and 93.9% (cement-tooth). For group II, values of 94.6% (cement-crown) and 96.0% (cement-tooth) were found. Group III revealed results of 73.5% (cement-crown) and 53.1% (cement-tooth). The influence of TCML on the marginal adaptation was not significant ($P > .28$). Although the results of group III showed a tendency to lower marginal adaptation, the high variation of results prevented finding significant differences between the individual groups before TCML ($P = .000$) nor after TCML ($P < .019$). The gap width between group I (165 μm), group II (97 μm), and group III (124 μm) was statistically significantly different ($P = .000$), whereas between groups II and III, no significant difference could be found ($P = .144$). The medians ($25^{th}/75^{th}$ percentile) of fracture strength were 643 N (608 N/682 N) for Group I, 556 N (444 N/651 N) for Group II, and 496 N (418 N/580 N) for Group III. Tukey-Kramer statistical analysis showed no significant statistical differences between all groups. ***Conclusion:*** There are no differences in terms of fracture strength between teeth restored with all-ceramic or metal-ceramic single crowns. All-ceramic restorations present higher marginal adaptation compared to the control group. Lithium disilicate in combination with a resin luting agent, can act as a biomimetic material, optimizing the distribution of the occlusal stresses at the cervical margin.

Second Place

FEM Analysis of Tilted Vs Up-Right Implants

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Aims: The aim of this study was to measure, with a three-dimensional finite element analysis, the stresses generated in the peri-implant bone and metal framework of a full-arch prosthesis using up-right or off-angle implants. ***Methods:*** A virtual model of the edentulous jaw was created. In the first test, the stresses transmitted to the peri-implant bone were evaluated simulating different single implant inclinations (0 degrees, 15 degrees, 30 degrees, and 45 degrees) under a 150 N vertical load. In the second test, four implants were inserted in the mandible and splinted together with a fixed full prosthesis. A 150 N vertical load was applied on the distal cantilever. The bone and metal framework stresses were evaluated in two different conditions: using up-right distal implants or 45-degree inclined distal implants. ***Results:*** A single tilted implant transmits higher stresses to the peri-implant bone than an up-right implant, up to 135.8% more. When the implants are splinted in a fixed full prostheses, the use of 45-degree tilted distal implants reduce the stresses up to 66.7% in the peri-implant bone and up to 42.3% in the metal framework, when compared to the use of up-right implants. ***Conclusion:*** The use of 45-degree tilted distal implants in a full fixed prostheses allows the reduction of the distal cantilever and thus the reduction of the stresses generated in the peri-implant bone and metal framework.

Third Place

Effect of Subgingival Depth of Implant Placement on the Dimensional Accuracy of the Implant Impression: An In Vitro Study.

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In some instances, an implant needs to be placed deep subgingivally, which may result in a less accurate impression of the implant. ***Purpose:*** The purpose of this study was to evaluate the effect of subgingival depth of implant placement on the accuracy of implant impressions. ***Material and Methods:*** A stone master model was fabricated with five implant analogs (RN synOcta analog) embedded parallel to each other at the center (E) and the four corners (A, B, C, and D). The vertical position of the shoulders of the implants was intentionally different among the implants: A and E were flush with the top surface of the model, B was 2 mm below, and C and D were 4 mm below the surface. The horizontal distances of implants A, B, C, and D from E were measured with a measuring microscope. A cross-shaped metal measuring bar was then fabricated and connected to E, with the arms of the casting designed to be 2 mm above the top surface of the model and incorporating a reference mark. With the measuring bar connected to E, the vertical distances from the apical surfaces of A, B, C, and D to the measuring reference marks were measured with a digital micrometer. The body of the impression coping for implant D was modified by adding 4 mm of additional impression coping, while standard impression copings were used for all other implants. Open tray impressions were made using medium-body polyether material (Impregum Penta) or a combination of putty and light-body vinyl polysiloxane (VPS) material (Elite HD+) (n = 15). Casts were then poured with type IV dental stone. The vertical and horizontal distances of the casts were measured with the methods previously outlined for the master model. The distortion values that were determined as differences between the measurements of the master model and those of the casts were collected for statistical analysis. Two-way and one-way repeated measures ANOVA followed by Tukey's HSD test were performed to compare the distortion values ($\alpha = .05$). ***Results:*** For vertical measurements, two-way repeated measures ANOVA showed no significant depth ($P = .36$), material ($P = .24$), or interaction effects ($P = .06$). However, it showed significant depth effect for horizontal measurements ($P = .01$). Within the polyether group, one-way repeated measures ANOVA showed significant differences in horizontal measurements among the implants with different depths ($P = .03$). The post hoc Tukey's test showed that the impression of 4-mm-deep implants with normal impression copings (C) was significantly less accurate than impressions of 0-mm-deep implants (A) ($P = .02$). Within the VPS group, there was no significant difference among the implants with different depths ($P = .09$). ***Conclusions:*** There was no effect of implant depth on the accuracy of the VPS group. However, for the polyether group, the impression of an implant placed 4 mm subgingivally showed a greater horizontal distortion compared to an implant placed more coronally. Adding a 4-mm extension to the retentive part of the impression coping eliminated this difference.