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ASSESSMENT OF DIFFERENT TECHNIQUES AND MATERIALS FOR DENTAL IMPRESSION ON IMPLANTS BY OPTICAL MICROSCOPE

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INTRODUCTION

In implant prosthodontics, 50% of the errors generally encountered relate to the techniques used in implant impression and cast contruction. The remaining 50% of errors are generated by inaccurate laboratory procedures. The current dental literature reports conflicting results regarding the best material and the best technique to obtain a faithful reproduction of the position of the implants in an edentulous arch.

AIM

The aim of this in vitro study was to evaluate by an optical microscope the accuracy of the dental impressions made with 7 different techniques in full-arch rehabilitation dental implant rehabilitations.

MATERIALS AND METHODS

A cast metal framework was realized using a master cast representing a superior jaw in which 4 implants were inserted at the level of the canines and of the first molars. Then implant analogues were screwed to the metal framework and a simplified master cast was realized. This master cast was used for all the tests subsequently described. Impressions of the master cast have been taken using different materials and techniques:

Impregum (polyether) + open tray technique (OTI);

Impregum (polyether) + closed tray technique (CTI);

Impregum (polyether) + open tray splintied technique (OTIS);

Ramitec (polyether) + open tray technique (OTR);

Ramitec (polyether) + closed tray technique (CTR);

Ramitec (polyether) + open tray splinted technique (OTSR);

BF plaster (plaster dental impression) + open tray technique (PLASTER).

For each of these techniques 5 impressions of the master cast have been taken. Standard plastic impression trays provided with rimming were used. A special device was used to standardize the force exerted during the impression and the direction of the impression tray. Casts have been realized connecting abutment analogues into the impressions. The accuracy of the framework was evaluated by the "one screw test" or Sheffield's test, screwing the metal framework previously realized on the 35 casts. An optical microscope (Smartscope MVP) with a 120x magnification was used to measure the accuracy of the interface between the abutment analogs incorporated in the casts and the metal framework. For each cast 8 measurements were taken: 4 screwing the framework at the level of the implant 26 and 4 screwing the framework at the level of the implant 16.

STATISTICAL ANALYSIS

For each of the 35 models average values of deviation compared to the master cast were obtained when screwing the stiff framework according to the Sheffield's test. This information was subsequently compared with the respective average values of the master model using a T-test to a sample (one sample T-test).

RESULTS

The casts made with the techniques PLASTER (0.077±0.033 µm, p=0.221), OTI (0.095±0.042 µm, p=0.111) and OTSR (0.140±0.080 µm, p=0.078) did not show a significant difference compared to the master model (0.056±0.047 µm). Considering both the mean values compared to the master cast and the standard deviation of these three techniques, respectively V=0.43, V=0.44, V=0.57 the models obtained with plaster resulted the most similar to the master cast.

CONCLUSION

1) Closed tray techniques were the least reliable;

2) The splinting of impression copings with acrylic resin did not improve accuracy;

3) The association of an open tray technique with a stiff material (PLASTER) exhibited the best accuracy.

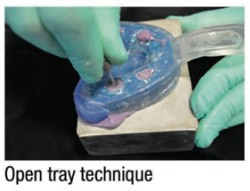

Starting clinical situation


Initial model


Palladium alloy framework


Master cast


Impression simulator


Open tray technique


Closed tray technique

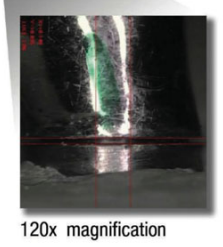

Splinting


Realized models


Palladium alloy framework


Sheffield's Test


Abutment - framework interface

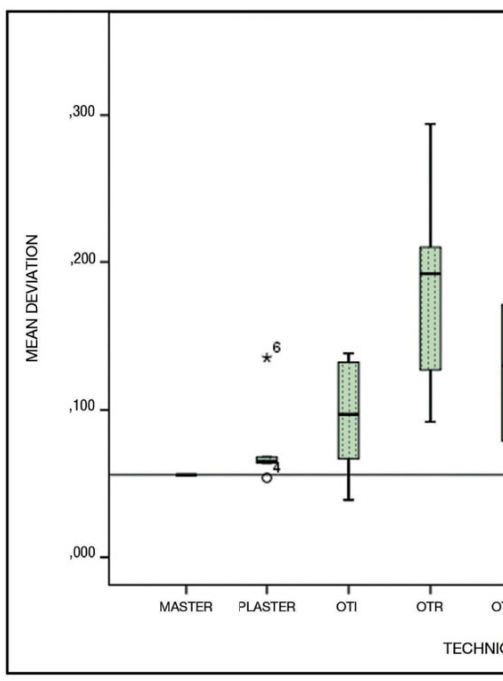

120x magnification

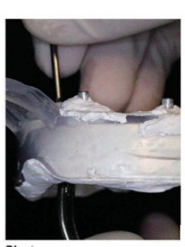
	Mean + SD (p value)		
	Screwing in 16 (Master: 0.039 ± 0.038)	Screwing in 26 (Master: 0.073 ± 0.054)	Mean value (Master: 0.056 ± 0.047)
PLASTER	0.098 ± 0.070 (p=0.133)	0.057 ± 0.024 (p=0.207)	0.077 ± 0.033 (p=0.221)
OTI	0.108 ± 0.064 (p=0.075)	0.082 ± 0.029 (p=0.531)	0.095 ± 0.042 (p=0.111)
OTR	0.188 ± 0.084 (p=0.016*)	0.178 ± 0.085 (p=0.050*)	0.183 ± 0.078 (p=0.022*)
OTRS	0.190 ± 0.108 (p=0.036*)	0.090 ± 0.053 (p=0.515)	0.140 ± 0.080 (p=0.078)
CTR	0.209 ± 0.069 (p=0.005*)	0.261 ± 0.086 (p=0.008*)	0.235 ± 0.077 (p=0.006*)
CTI	0.193 ± 0.069 (p=0.008*)	0.133 ± 0.099 (p=0.248)	0.163 ± 0.028 (p=0.001*)
CASI	0.084 ± 0.019 (p=0.006*)	0.088 ± 0.027 (p=0.269)	0.086 ± 0.017 (p=0.016*)

*statistically significant difference compared to the Master cast

Results of Sheffield's test (measurement unit: µm)

Optical microscope (SmartScope)




Plaster

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[2] **Jemt T**. Failures and complications in 391 consecutively inserted fixed prostheses supported by Branemark implants in edentulous jaws: a study of treatment from the time of prosthesis placement to the first annual checkup. Int J Oral Maxillofac Implants 1991; 6: 270-6.