

POSTER

Accuracy of different dental implant impression techniques comparing different impression materials and digital impression

Area: Implant Supported Prosthesis

University/Department:

Genoa University/Prosthodontics

Authors:

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Presenter:

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Objective:

The aim of this in vitro study is to evaluate the accuracy of 8 different implant impression techniques for fabrication of multiple-implant prostheses. Splinted and unsplinted techniques, different impression materials and digital impression were compared.

Materials:

A master cast was used which represented a jaw in which 4 implants were inserted at the level of the canines and of the first molars.

Impressions of the master cast were taken using different materials and techniques:

- 1) Snap-on impression technique using polieter #1 (Impregum Penta, 3M ESPE, St Paul, MN) (CTI)
- 2) Pick-up impression technique using polieter #1 (Impregum Penta, 3M) (OTI)
- 3) Pick-up impression technique using polieter #1 (Impregum Penta, 3M) plus a splint of the impression copings using acrylic resin (OTIS)
- 4) Snap-on impression technique using polieter #2 (Ramitec Penta, 3M) (CTR)
- 5) Pick-up impression technique using polieter #2 (Ramitec Penta, 3M) (OTR)
- 6) Pick-up impression technique using polieter #2 (Ramitec Penta, 3M) plus a splint of the impression copings using acrylic resin (OTRS)
- 7) Pick-up impression technique using impression plaster (BF Plaster, Dental Torino, Italy) (GESSO)
- 8) Digital impression (True Definition Scanner, 3M)

For each of these techniques 5 impressions of the master cast were taken. A special device was used to standardize the direction of the impression tray and the force exerted during standard impressions. Casts were realized from the traditional impressions.

A three-dimensional CMM (Coordinate Measurement Machine Crysta-Apex S, Mitutoyo America Corporation, Aurora, IL) was used in a specialized laboratory (Createch Medical S.L., Mendaro, Spain) to measure the master model in order to obtain the actual data of the three-dimensional position of the implants.

Distances among the implants and angle values for each implant in the casts derived from traditional impressions were calculated thanks to the CMM. These data and STL files from the digital impressions were compared with the data of the three-dimensional position of the implants in the master cast as obtained by the CMM.

The best and the worst impressions made with traditional techniques as well as the best and the worst impressions made with digital impression (as assessed by the CMM) were selected in order to fabricate 4 milled titanium bars. The accuracy of the frameworks was evaluated by the "one screw test" or Sheffield's test, screwing the metal frameworks on the master cast. An optical microscope (SmartScope MVP) with a 120x magnification was used to measure the accuracy of the interface between the abutment analogues incorporated in the cast and the metal frameworks. For each framework 8 measurements were taken: 4 screwing the framework at the level of the implant in position 26 and 4 screwing the framework at the level of the implant in position 16.

Results:

Significant differences in accuracy were found comparing the different impression techniques on the base of CMM measurements. Digital impression performed the best, followed by plaster impression. These techniques also revealed the lowest variation. Traditional impression techniques revealed a greater variability in the results.

Sheffield's test revealed a medium gap of 0.015 mm (range: 0.000-0.038 mm) and 0.019 mm (range: 0.000-0.039 mm) for the best and worst digital impression respectively, and of 0.026 mm (range: 0.000-0.077 mm) and 0.076 mm (range: 0.000-0.186 mm) for the best and the worst traditional impression respectively.

Conclusion:

Digital impression showed the best accuracy among the tested techniques and seems a viable alternative to traditional impression materials for fabrication of full-arch implant-supported prostheses. Dealing with traditional impressions, the open tray technique using rigid materials exhibited the greatest accuracy.