Digital vs Conventional Implant Impressions: Influence of the technique on the fit accuracy of 3-unit implant-supported screw retained fixed dental prostheses

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Statement of the problem
Poor fit of implant-retained prostheses can lead to mechanical and biological complications. The foundation of an optimally fitting restoration is established with an accurate impression.

There is limited evidence comparing the marginal fit of implant restorations made using conventional impression techniques and intra-oral scanning. The direct measurement of the accuracy of fit of implant-supported fixed frameworks produced by conventional and digital impressions has not been addressed so far in the literature.

Materials & Methods
- Ten digital and ten conventional impressions were made from a urethane-based tyndall model which had two tissue level implants replacing the left maxillary first molar and first premolar.
- The digital implant impressions were made with an intraoral scanner using the manufacturer recommended scan bodies (Fig. 1) (Dental Wings iOS) and the addition silicone impressions were made using 3D printed custom trays (Fig. 2). The casts were digitized with a laboratory scanner (Dental Wings Series 7).
- Twenty identical frameworks were designed (Fig. 3) and milled from Cobalt-Chromium alloy (Conon®) and were tested for their fit accuracy using a scanning electron microscope. To directly visualise the implant-abutment junction, the master model was trimmed (Fig. 5).

The measurement groups were:

- The “passivity” of fit was compared between (i) CM and TM, and (ii) CP and TP with one abutment screwed in at 15Ncm² (one-screw test).
- The “accuracy” of fit was compared between (iii) CMB and TMB, (iv) CPB and TPB, and (v) CMB+CPB and TMB+TPB when both abutments were tightened at 35Ncm².

Results
The Mann-Whitney U test revealed that digital impressions resulted in statistically significantly smaller marginal gaps for all comparisons (p < 0.001). The 95% confidence intervals of the medians of all groups showed that the median marginal gap when both abutments were torqued at 35 Ncm² was <25 μm and when one abutment was torqued at 15 Ncm² was <50 μm. The results suggest that implant-supported 3-unit screw-retained fixed dental prostheses manufactured following impressions from an intra-oral scanner have a more passive and more accurate fit than the ones manufactured following conventional silicone impressions and digitization of the casts.

Conclusions
- Prostheses manufactured following impressions from an intra-oral scanner had a statistically significantly more passive fit when compared to the ones manufactured following silicone impressions and digitization of the casts.
- Prostheses manufactured following impressions from an intra-oral scanner had a statistically significantly more accurate fit when compared to the ones manufactured following silicone impressions and digitization of the casts.
- The impressions from an intra-oral scanner seem to be more consistent than the ones from silicone impressions and cast digitization.

References