

**Title**

COMPARISON OF THE ACCURACY OF AN INTRAORAL AND AN EXTRAORAL LABORATORY SCANNER ON THE TOTALLY EDENTULOUS MAXILLA: A 3D ANALYSIS.

**Authors**

G. RUGGIERO<sup>1</sup>, F. Sorrentino<sup>1</sup>, R. Sorrentino<sup>1</sup>

**Affiliations**

<sup>1</sup> Università Federico II, Napoli, ITALY

**Body**

**Background:** The aim of this study was to compare the accuracy between an intraoral scanner (TRIOS 3, 3Shape) and an extraoral laboratory scanner (DScan 3, EGSolutions) on the reference typodont of an upper totally edentulous jaw. The accuracy of the extraoral scanner was evaluated from the direct scans of the impressions in polysulphide (through a reverse process), then from the scans of the models obtained pouring the stone in the impressions.

**Methods:** A reference typodont (RT) in polyurethane resin was made; the RT was scanned using an industrial metrological machine (Atos Core-80, GOM), obtaining a digital reference scan, saved in ".stl" format. The areas needed for the construction of a complete maxillary denture were included in the scans. 10 intraoral scans (dIOM) were performed proceeding longitudinally along the ridge's occlusal side of the full arch, starting from the left maxillary tuberosity and ending at the right one, then continuing on the buccal side and, eventually, on the palatal side. The authors created a device to take impressions with a repeatable, consistent process that can guide and position an individual impression tray in resin onto the typodont, with the same standardized pressure and orientation in the space. 10 impression trays were made with a dedicated software (PreForm 2.15.0, Formlabs) and printed with a 3D printer (Form 2, Formlabs), in order to obtain 10 identical ones. With this device, 10 impressions in polysulphide (Permlastic, Kerr) were obtained; then, by the laboratory extraoral scanner, a scan of each impression was done. With a dedicated software (DentalCad, EGSolutions) 10 digital models (dREM) were obtained processing "in reverse" the physical impressions. Eventually, a type IV stone (Elite Stone, Zhermack) was poured in the impressions to obtain 10 physical gypsum models (dEOM), then scanned as well by the laboratory scanner. In this way, 3 groups of scans were done (n=10) and saved in ".stl" format for the comparison, performed importing them into a dedicated software (Geomagic Control X), and the accuracy was evaluated calculating trueness and precision, measured in micrometres.

Data were statistically analyzed by means of a dedicated software (SPSS 25, IBM).

**Results:** Trueness values (95% c.i.) were: dIOM=49,1[37,9-60,3]; dREM=349,1[290,7-407,6]; dEOM=1243[1130,7-1355,3]. Precision values (95% c.i.) were: dIOM=48,7[37,8-59,5]; dREM=346,8[293,8-399,8]; dEOM=1241,8[1129,6-1354]. Statistically significant differences were detected between the experimental groups.

**Conclusion:** Intraoral scanning allows better accuracy than the scanning of the model with an extraoral laboratory scanner. The reverse process performed on the direct scans of the impressions guarantees better accuracy compared to the scanning of the corresponding model but worse accuracy compared to the intraoral one. According to the authors, these results could be explained by the distortion of the materials used to make the impression and to make the model.