"A Novel Approach to Reduce Microbial Adhesion, Cost, and Weight of ill-Fitting Obturators Using a Digital Workflow: In Vitro Study and Clinical Case Series"

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Introduction

Some of the most common complications with obturator prosthesis are: microbial adhesion over time, the cost/time associated with fabrication, lack of retention due to increased weight, and oro-nasal leakage associated with a poorly sealed prosthesis due to changing defect shape/size. The use of a digital workflow to fabricate a hollow obturator prosthesis has many benefits such as reduced microbial adherence, reduced time of fabrication, reduced weight of the prosthesis

Methodology

One hundred and thirty-two total 10x2mm acrylic resin discs were fabricated using a total of 6 different methods. Twenty-two discs were fabricated from a pre-designed wax disc or STL file by each method including compression-molding (Lucitone 199), injection molding (Ivocap High Impact), CAD-CAM milling (Ivotion PMMA on Ivoclar PrograMill7) and rapid prototyping on Carbon 3D printer (Lucitone Digital Print, Dentsply Sirona), Sprintray Pro95 S 3D printer (Dentca Denture Base II, Dentca), and the EnvisionTec Envision One 3D printer (Flexcera Base, Desktop Health). One disc of each material was imaged by scanning electron microscopy. The remaining 21 discs of each material were evaluated for adherence of *C. albicans* by two different primary methods. Discs of each manufacturing method were either suspended in inoculated TSB or placed onto a uniform lawn of *C. albicans* on an SBA plate and allowed to incubate at 37°C. All discs were removed from inoculated media and washed three times in sterile water for 1 minute at 100rpm on a shaker. Attached cells were quantified by spiral plating, visualized by staining with crystal violet, or used to re-inoculate sterile plates.

Results

Both experimental designs demonstrated statistically significantly different levels of Candida adherence to differently manufactured denture base materials. SEM imaging demonstrated greatest surface roughness for compression molded samples and the least surface roughness for injection molded samples and rapid prototyping with Carbon M2.

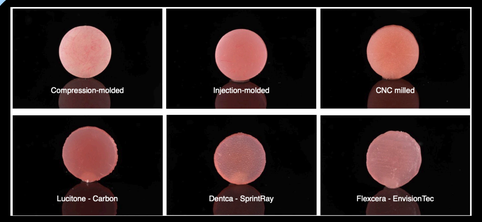

Fig.1. Prepared discs and SEM images

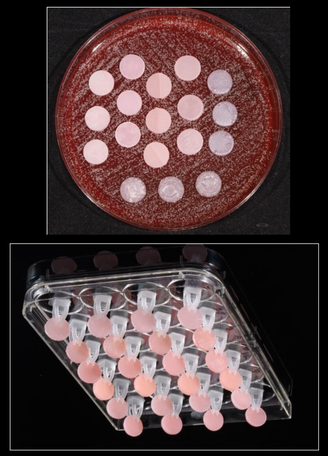

Fig.2. Discs prepared for incubation

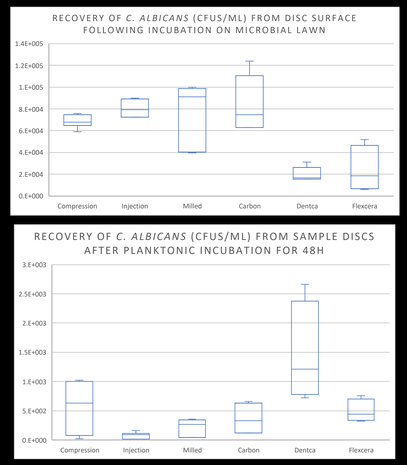

Fig.3. Box and whisker plots showing cell counts recovered from sample discs

Discussion

The use of CAD/CAM technology to fabricate hollow obturator prosthesis has many benefits . Our study suggests that Digital Lucitone Print (Carbon M2) bases have similar microbial adhesion properties when compared to injection molded base materials, but has favorable properties when compared to compression molded bases. This digital workflow allows for reduced cost/time for the patient and provider, while also incorporating a material with a smoother surface texture than conventional compression molded obturators.

References

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3. Linder,William Emory,.II. (2022). *Evaluation of adherence of candida albicans to differently manufactured acrylic resin denture base materials* (Order No. 29069036). Available from Dissertations & Theses @ University of North Carolina at Chapel Hill; ProQuest Dissertations & Theses Global.
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Case 1

Fig. 4. Initial presentation

Fig. 5. Intraoral scan

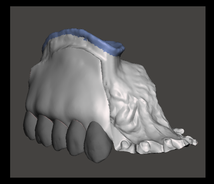

Fig. 6. Monoblock try-in

Fig. 7. Wash impression of try-in

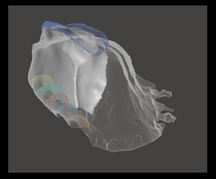

Fig. 8. Hollowing of prosthesis

Fig. 9. Final 3D Printed obturator

Case 2

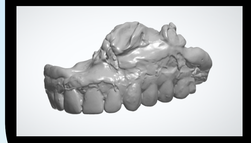

Fig. 10. Initial Obturator

Fig.11. Wash impression of duplicate

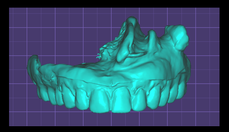

Fig. 12. Digitized wash impression

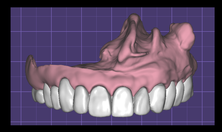

Fig. 13. Final design

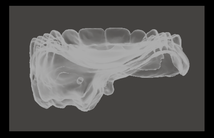

Fig.14. Hollowing of prosthesis

Fig.15. Final 3D printed obturator

Fig. 16. Delivery Final Prosthesis

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