

Introduction
The rapidly advancing field of consumer three dimensional (3D) printing has opened the door for expanded uses in the field of implant dentistry. This includes surgically printed guides to 3D models of patient anatomy. In cases requiring significant guided bone regeneration for predictable implant placement, a 3D model of the patient’s local anatomy could aid in treatment planning and surgery.

Material and Methods
Two patients were planned for implant placement in areas containing significant horizontal and vertical ridge deficiencies. These sites were planned for guided bone regeneration utilizing tenting screws, allograft, titanium reinforced membranes, and fixation screws.

Cone beam computed tomography scans were taken. 3D renderings were trimmed and modified to print only the areas of interest. 3D printers were loaded with a polylactic acid (PLA) filament, a thermoplastic, biocompatible, and bio absorbable material derived from corn. Models were disinfected with alcohol immersion for 15 minutes followed by rinsing with distilled water. One hour prior to surgery models were placed in 0.12% Chlorhexidine.

Case 1:
Titanium reinforced membrane was pre-formed on the model, allograft bone was placed on the ridge, and the membrane was fixated intra-orally.

Case 2:
Wax-up on the model of the desired graft size and location was used to fabricate a stent. Stent was used to load membrane and bone graft intra-orally.

To observe any dimensional differences between the model and clinical proportions, measurements were taken intra-orally and on the model with the aid of a stent.

Results
In all cases, the model provided enough accuracy for minimal to no adjustments of the template and titanium reinforced membrane during transfer from model to patient. Periodontal probe measurements deviated within one millimeter with models having a relatively smaller dimension. Pre-adapted bio-materials on the model allowed for easy placement and adaptation intra-orally.

Conclusions
3D printing aided in the treatment planning and surgical steps of these guided bone regeneration procedures. The concept of guided bone regeneration can be difficult to grasp for some patients, and allowing the patient to see and feel the defect in the alveolar bone could help overcome this inhibition. The discrepancy in dimensions could be related to the dimensional inaccuracies of the CBCT and/or post scan modifications for printing. Nonetheless, the dimensions were accurate enough to facilitate the handling of biomaterials extra-orally. Being able to manipulate biomaterials on the model can save valuable chair time for the clinician and, most importantly, the patient.

Reference:

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