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Minimally Invasive, Precise and Stable Technology of Digital Titanium Mesh-Assisted Bone Augmentation

Songhang Li, Xiaoxiao Cai*

State Key Laboratory of Oral Diseases & National Clinical Research Center for Oral Diseases & Department of Implant dentistry, West China Hospital of Stomatology, Sichuan University, Chengdu, China.

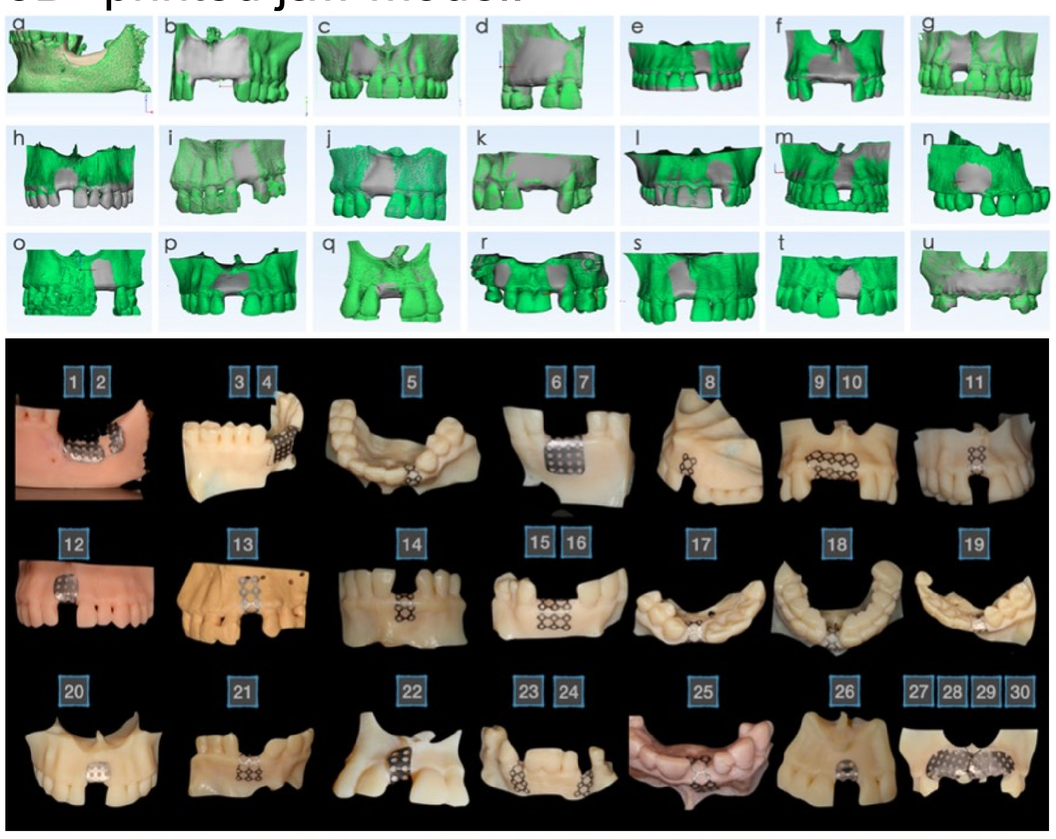
Background

An adequate volume of bone all around the implant is critical to obtaining the long-term success of implant therapy. Considered as one of the most successful methods applied for bone defect reconstruction, Guided Bone Regeneration (GBR) finds its wide application for augmenting bone volume around the implants reconstructed.

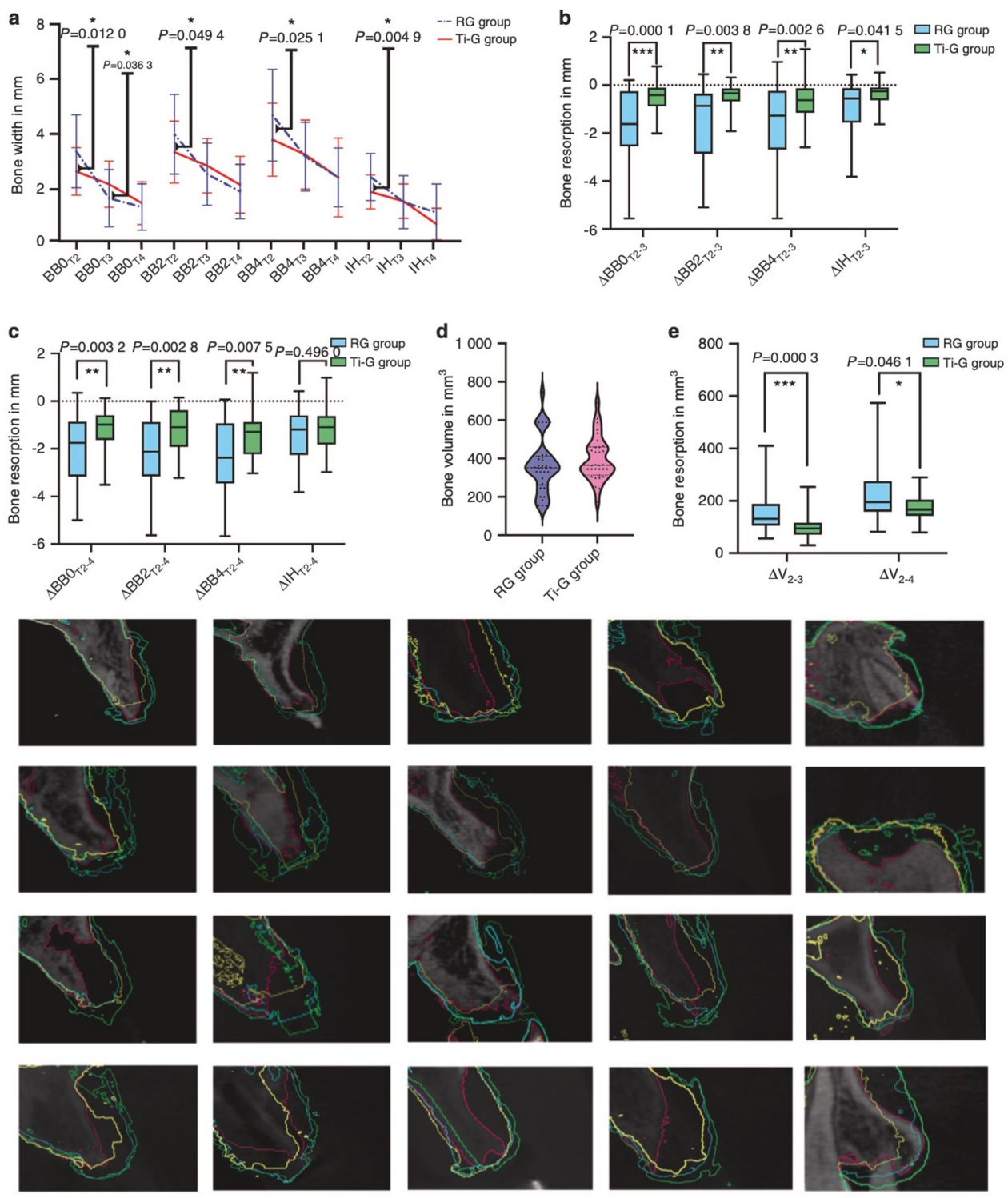
Resorbable membranes are the most used membranes in GBR but due to their spatial instability, desired therapeutic effects cannot be achieved in most cases. In cases of non-resorbable membranes, typically titanium mesh, although they can maintain space stability, the incidence of complication attributable to their relatively stiff texture is high.

Methods

Considering all those drawbacks and based on evidence-based medicine, bone augmentation has been conducted digitally in the bone defect site in accordance with the desired bone contour and digital titanium mesh has been completed with the 3D- printed jaw model.



Results and Conclusions



The prefabricated digital titanium mesh has significantly shortened the operation time and lessened the patient's pain. What's more, it can also prevent the generation of ineffective bone augmentation, and greatly reduce the exposure rate of titanium mesh (exposure rate: 9.52%). As for precision, digital titanium mesh- assisted bone augmentation achieves a precision of up to 95.82%. Besides, after one year of loading, the labial plate of the implant remained 2.12±1.04 mm, which is comparable to the initial design of digital titanium mesh-assisted bone augmentation. The stable osteogenesis space provided by the digital titanium mesh is also one of the strengths of this technology. At 6-8 months after surgery, the volume absorption percentage of bone grafts in the group of absorbable membranes reached 37.57% while in the group of digital titanium mesh group, the percentage stood only at 23.40%.

In conclusion, the technology of digital titanium mesh-assisted bone augmentation is minimally invasive, precise as well as stable. Going forward, such a technology may allow future bone augmentation to advance in the direction of precision and controllability.