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Clinical and volumetric outcomes after vertical ridge augmentation using computer-aided-design/computer-aided manufacturing (CAD/CAM) customized titanium meshes: a pilot study

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Abstract

Background

One of the most recent innovations in bone augmentation surgery is represented by computer-aided-design/computer-aided-manufacturing (CAD/CAM) customized titanium meshes, which can be used to restore vertical bone defects before implant-prosthetic rehabilitations. The aim of this study was to evaluate the effectiveness/reliability of this technique in a consecutive series of cases.

Methods

Ten patients in need of bone augmentation before implant therapy were treated using CAD/CAM customized titanium meshes. A digital workflow was adopted to design virtual meshes on 3D bone models. Then, Direct Metal Laser Sintering (DMLS) technology was used to produce the titanium meshes, and vertical ridge augmentation was performed according to an established surgical protocol. Surgical complications, healing complications, vertical bone gain (VBG), planned bone volume (PBV), lacking bone volume (LBV), regenerated bone volume (RBV), average regeneration rate (RR) and implant success rate were evaluated.

Results

All augmented sites were successfully restored with definitive implant-supported fixed partial dentures. Measurements showed an average VBG of 4.5 ± 1.8 mm at surgical re-

entry. Surgical and healing complications occurred in 30% and 10% of cases, respectively. Mean values of PBV, LBV, and RBV were 984, 92, and 892 mm^3, respectively. The average RR achieved was 89%. All 26 implants were successfully in function after 1 year of follow-up.

Conclusions

The results of this study suggest that the bone augmentation by means of DMLS custom-made titanium meshes can be considered a reliable and effective technique in restoring vertical