Clinical Advantages of 3D Printing Technologies and CARS

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INTRODUCTION

Implant-supported restorations have proven to be a predictable option for replacing missing dentition. In cases of inadequate bone quantity, the bone volume can be increased by bone augmentation procedures. Alveolar ridge augmentation refers to procedures designed to correct a deformed alveolar ridge, typically in preparation for dental implant placement. Several factors can affect bone regeneration, including the morphology of the defect at the implant site.
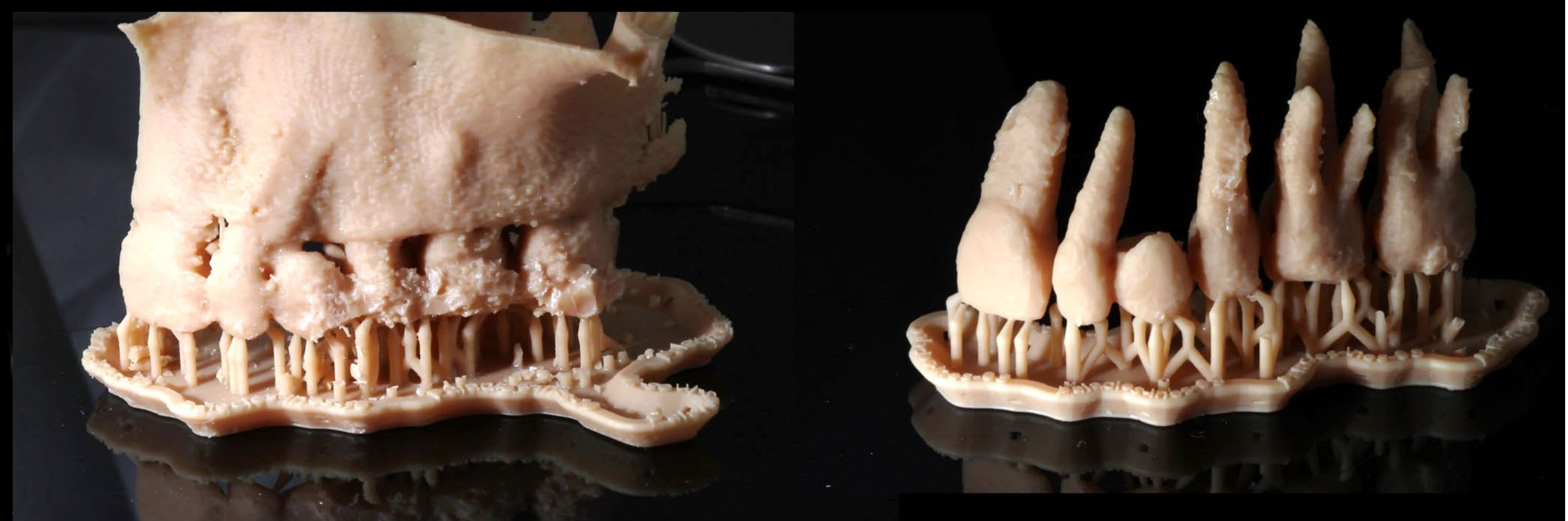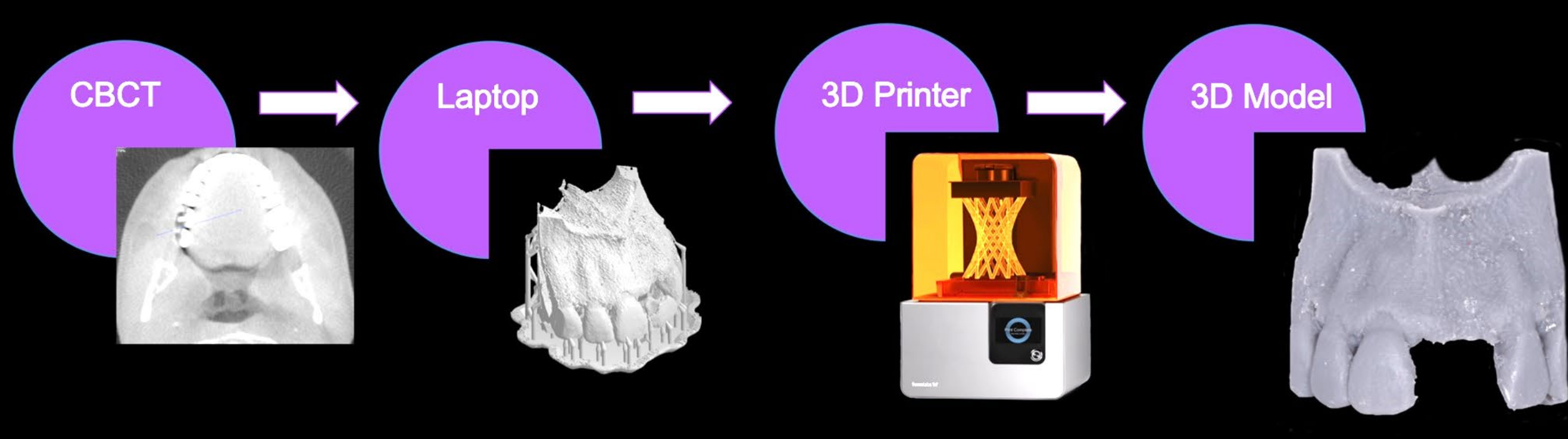
In the field of alveolar ridge augmentation, printing a 3D presurgical model can result in significant reduction of surgical time, patient discomfort and a more accurate implant placement. The purpose of this poster is to present a 3D printed presurgical model to improve accuracy in the Custom Alveolar Ridge Splitting (CARS) technique for maxillary anterior ridge augmentation.

MATERIALS AND METHODS

Cone-beam computed tomographic (CBCT) imaging provides increased visualization of bone morphology and bone aberration and appreciation of surrounding anatomic structures. CBCT Digital Imaging and Communications in Medicine (DICOM) files converted into stereolithography files have been used in the production of 3-dimensional printed surgical guides for implant placement for many years and now this technology can be used in Customized Alveolar Ridge Splitting (CARS). Trephine burs have been used for the removal of failed implants and autogenous bone graft harvesting in this technique they are used as aid for the bone expansion.

When Combining the 3D printed guide with the trephine bur to help create better implant position and bone expansion the surgeon is able to obtain a more predictable result and a more esthetic final restoration thanks to the accuracy of the 3D printed model.

STEPS IN PRODUCTION OF A 3D MODEL

SEQUENCE OF PROCEDURE
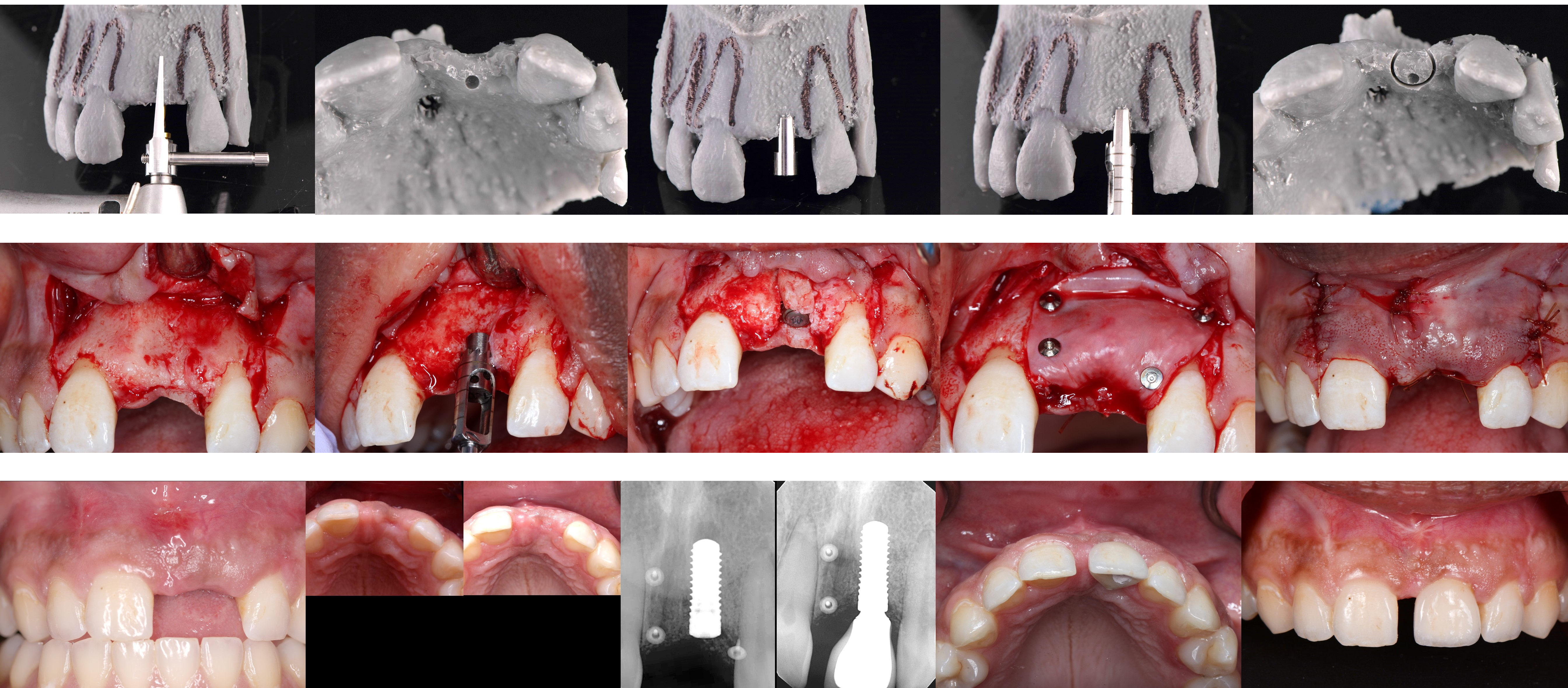
CONCLUSION

The utilization of CAD/CAM and 3D-printing technologies for digital re-construction for alveolar ridge augmentation procedures can present significant benefits for the patient and the clinician. It allows for detailed preoperative planning, design of the desired final implant placement and virtual evaluation of the desired outcome relative to the final prosthetic reconstruction. All of them crucial factors for success in ridge augmentation procedures.

REFERENCES

1. Albrektsson T, Dahl E, Enbom L, et al. Osseointegrated oral implants. A Swedish multicenter study of 8139 consecu-tively inserted Nobelpharma implants. J Periodontoly 1988;59:287–296.
2. Adell R, Eriksson B, Lekholm U, Brånemark PI, Jemt T. Long-term follow-up study of osseointegrated implants in the treatment of totally edentulous jaws. Int J Oral Maxillofac Implants 1990;5:347–359.
3. Bernstein S, Cooke J, Fotek P, Wang H-L. Vertical bone augmentation: where are we now? Implant Dent. 2006;15:219–28.
4. Buser D, Brägger U, Lang NP, Nyman S. Regeneration and enlargement of jaw bone using guided tissue regeneration. Clin Oral Implants Res 1990;1:22–32.
5. Froum SJ, Kadi RO, Wangsrimongkol B, Hengjeerajaras P, Reis N, Yu PYC, Cho SC. The Custom Alveolar Ridge-Splitting (CARS) Technique for Predictable Horizontal Ridge Augmentation in the Atrophic Anterior Maxilla: A Retrospective Case Series Study. Int J Periodontics Restorative Dent. 2021 May-Jun;41(3):397-403.