Future Dental Journal xxx (2017) 1–8

Contents lists available at ScienceDirect

Future Dental Journal

journal homepage: http://www.journals.elsevier.com/locate/fdj

Evaluation of piezotomed alveolar ridge splitting with stereolithographic surgical guide for implant placement (clinical study)

Mohamed N. Mustafa [a, *], Abdelaziz F. Khalil [b], Lydia N. Melek [b]

[a] Ras el Teen Hospital Ministry of Health, Alexandria, Egypt
[b] Oral and Maxillofacial Surgery, Faculty of Dentistry, Alexandria University, Egypt

ARTICLE INFO

Article history:
Received 15 May 2017
Accepted 24 July 2017
Available online xxx

Keywords:
Ridge splitting
Stereolithographic surgical stent
Flapless
Implants

ABSTRACT

Introduction: Narrow dentoalveolar ridges remain a serious challenge for the successful placement of endosseous implants. Several techniques for this procedure may be considered, such as guided bone regeneration, bone block grafting, and ridge splitting for bone expansion. The ridge split procedure provides a quicker and a more reliable method. Advances in technology, Stereolithography allow fabrication of surgical guide from 3D generated models for precise implant placement.
Objectives: Evaluation of minimally invasive ridge splitting procedure aided with surgical guide.
Materials and methods: A clinical study was performed on a total of 7 patients with mandibular free end saddle. The sample was selected conveniently to fulfill a list of inclusion and exclusion criteria. Then the selected participants performed ridge splitting with the aid of surgical guide. After ridge splitting, all patients had simultaneous implant placement followed by clinical and radiographical evaluation over a period of 6 months.
Results: Merging the preoperative, immediate and 6 months postoperative CBCT images showed statistically significant values of accuracy and increase in bone width and bone density.
Conclusion: Alveoalar ridge splitting with the aid of stereolithographic surgical stent is a well acceptable technique for implant placement.

1. Introduction

Dental implants have become an integral part of comprehensive management of dental patients. Scipioni et al. [1] suggests that wherever dental implants are placed, a minimum thickness of 1–1.5 mm of bone should remain on both buccal and lingual/palatal aspects of the implant(s) to ensure a successful outcome. Thus, a major limitation for successful implant placement remains the problem of inadequate ridge. Several methods have been described to augment the alveolar crest such as onlay lateral ridge bone grafting [2], horizontal osteodistraction [3], and guided bone regeneration techniques [4]. These methods have drawbacks, such as greater financial cost, an increase in the overall treatment period, and possible donor site morbidity. Ridge split technique is a way to solve the problem of the width in narrow ridges with adequate height [5].

Two devices for cutting hard alveolar bone under adequate control have been described: microsaw devices [6] and piezoelectric devices [7]. Both may be used, regardless of bone quality [6,7]. Additionally, with these devices, it is possible to prepare thinner cuts than with conventional burs [8].

Stereolithography, a rapid prototyping technology (CAD/CAM), a newer outcome in dentistry allows fabrication of surgical guides from 3D computer generated models for precise implant placement. The advantages of this surgical protocol are its minimally invasive nature, accuracy of implant placement, predictability, less post-surgical discomfort and reduced time required for definitive rehabilitation [9].

In the light of the above information, this study was designed to introduce alveolar ridge splitting with the aid of surgical guide. A new idea that will reflect several advantages including preservation

* Corresponding author.
E-mail address: mohdnaeiem@hotmail.com (M.N. Mustafa).
Peer review under responsibility of Faculty of Oral & Dental Medicine, Future University.

https://doi.org/10.1016/j.fdj.2017.07.003

Please cite this article in press as: Mustafa MN, et al., Evaluation of piezotomed alveolar ridge splitting with stereolithographic surgical guide for implant placement (clinical study), Future Dental Journal (2017), https://doi.org/10.1016/j.fdj.2017.07.003

of the periosteum thus reducing the liability of complete bone fracture, increased accuracy of the surgical procedure, and the decreased operating time and postoperative complications as the segmental ridge splitting is done through a flapless approach with preservation of soft and hard tissues.

2. Materials and methods

2.1. Informed consent

Appropriate institutional ethical clearance from the Faculty Ethical Committee and written informed consent from the patients were obtained. All patients were informed about the aim of the study.

2.2. Patient selection

In this study fifteen implants were placed in 7 patients at the posterior mandible with deficient alveolar bone width using the stereolithographic surgical stent. Patients were selected from the Outpatient Clinic of Oral and Maxillofacial Surgery Department, Faculty of Dentistry, Alexandria University.

The inclusion criteria of this study were; patients having mandibular free end saddle with deficient ridge width (less than 5 mm), adequate ridge height between alveolar crest and inferior alveolar canal to accommodate implants, adequate oral hygiene, free of soft tissue or dental pathology, and patients accepting to participate in the study. The exclusion criteria were; patients suffering from relevant systemic and/or metabolic diseases, immunosuppressive and/or autoimmune diseases, and heavy smokers.

3. Materials

The materials used in the surgical procedure were; stereolithographic surgical guide using In2Guide™ system (manufactured by Kavo Dental Gmbh on behalf of Cybermed Inc., Korea), implant system (Kisses Biogenesis dental implant system, Korea), piezotome using specialized crest splitting tips (Satelec, a company of Aceton Group, France) and expanders (Dentium RS kit, Korea).

3.1. Patient evaluation

Presurgical clinical examination was performed for all patients: Patients data were collected; name, gender and age, medical and dental history were taken and the oral mucosa of the edentulous area was examined for color, texture, firmness and buccolingual measurement. Also, preoperative evaluation for all patients included cone beam computerized tomography (veraviewepocs 3D R100, J. morita, Japan, at 8 mA, 90 KV) (Fig. 1) to verify bone width, implant position, angulation, depth, and the planned position of ridge splitting by using reformatted cross-sectional images in the vertical plane.

Fabrication of the CAD/CAM surgical stent by stereolithography using In2Guide™ system. CBCT scan (veraviewepocs 3D R100, J. morita, Japan, at 8 mA, 90 KV) for all patients and scanning of the stone models were performed after taking impression of maxillary and mandibular arches. The treatment plan was performed using In2Guide™ software powered by OnDemand3DTM (version 1.0.9, Cybermed, Korea).

The surgical stent is mouth guard shaped rapid prototyping sculpture with custom sleeves which controls the drilling location, direction and depth. It is made with certified bio-compatible resin, the custom sleeves are made from titanium and are completely harmless to the body. Manufactured by a dental technician under

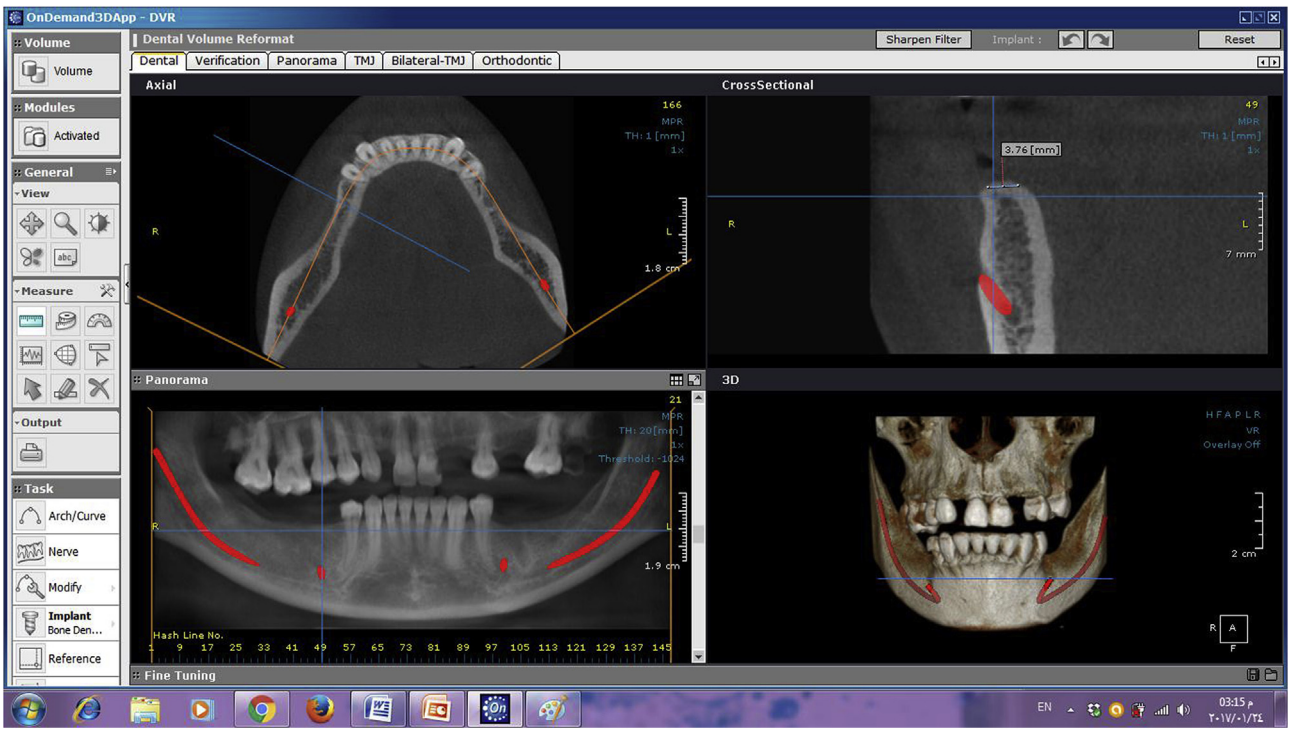

Fig. 1. Pre-operative CBCT at right mandibular second premolar. (Bone width = 3.76 mm, Bone density = 1059.27HU) and right mandibular second molar. (Bone width = 3.58 mm, Bone density = 771.31HU).

Please cite this article in press as: Mustafa MN, et al., Evaluation of piezotomed alveolar ridge splitting with stereolithographic surgical guide for implant placement (clinical study), Future Dental Journal (2017), https://doi.org/10.1016/j.fdj.2017.07.003