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EVOLUTION OF IMPLANT PLACEMENT IN NARROW ALVEOLAR RIDGE USING VERSAH DRILLS

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ABSTRACT

Objective: The study was designed to evaluate implant placement in narrow alveolar ridge using Versah Drills. **Subjects and methods:** The study included 20 patients, 12 females and 8 males. Patients were selected from the Outpatient Clinic of Oral and Maxillofacial Department, Faculty of Dental Medicine, Al Azhar University, Cairo, Boys. All patients have insufficient edentulous alveolar ridge width in need for implant placement to facilitate rehabilitation of the missing teeth. Data collected in form of diagnosis for the patients suspected to be good candidates for implant placement. A case history was taken including screening of systemic diseases and medications in details. Then, extra- and intra-oral clinical examinations were performed including checking of the occlusion and monitoring of his/her oral hygiene status. If the patient was clinically indicated for implant placement, a CBCT scan was done to review the bone density, alveolar ridge width and the height of alveolar bone in the area of implant placement and the anatomical structures in the area of surgery. **Results:** After immediately postoperative, 3 and 6 months, there was no statistically significant difference of bone density and ridge width between the mean immediate post-operative value, the value at 3 months, and the value at 6 months post-operatively. There was a statistically significant difference of marginal bone loss between the mean immediate post-operative value, the value at 3 months, and the value at 6 months post-operatively. **Conclusion:** Versah drills may allow expansion of the alveolar ridge bucco-lingually in an easier and less invasive way than the traditional surgical techniques.

Key words: Versah Drills, Dental implants, narrow alveolar ridge

INTRODUCTION

Alveolar bone is resorbed after tooth extraction or avulsion most rapidly during the first years [(1)]. Extraction of anterior maxillary teeth is associated with a progressive loss of bone mainly from the labial side. The loss is estimated to be 40-60% during the first 3 years and decreases to 0.2-0.5% annual loss there after [(2)]. The cause for resorption of alveolar bone has been assumed to be due to disuse atrophy, decreased blood supply, localized inflammation or prosthesis pressure.

Dental implants have become an integral part of comprehensive management of dental patients[(3)]. Successful implant therapy often requires sound osseous support. 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 [(4)]. For most standard implants, a minimum of 6 mm width is necessary for favorable outcome[(5)].

Narrow dento-alveolar ridges remains a serious challenge for the successful placement of endosseous implants [(6)]. Several techniques for this procedure may be considered, such as guided bone regeneration, bone block grafting, and ridge splitting for bone expansion [(7)]. These procedures were carried out before or after implant placement to establish at least 1mm bony wall around screw type implants. Although different techniques exist for atrophic ridges, there are chances of need for multiple

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surgeries which carries surgical risk and postoperative morbidity [8].

Osseodensification (OD), a non-extraction technique, was developed by Huwais in 2013, made possible with specially designed burs (Densah® Bur) Versah drills to increase bone density as they expand an osteotomy. These burs combine advantages of osteotomes with the speed and tactile control of the drilling procedures [9].

PATIENT AND METHODS

Twenty patients (8 males and 12 females) participated in this study. All of them were presented with insufficient edentulous alveolar ridge width in need for implant placement to facilitate rehabilitation of the missing teeth. Their ages were ranged from 20 to 40 years, with mean of (30.41).

A- Preoperative phase

All patients underwent pre-operative clinical examination: Patients' data were collected; name, gender and age, medical and dental histories were taken. Radiographic examination was carried out with conventional radiographs as well as CBCT to review the bone density, bone width and the height of alveolar bone being in the area of implant placement and the anatomical structures in the area of surgery (figure 1).

Study casts were prepared and mounted on a semi-adjustable articulator to evaluate the intermaxillary space, type of occlusion and direction of forces with respect to the site of the future implant.

B -Operative phase

All the patients were treated under local anesthesia using Aarticaine hydrochloride 4% with epinephrine 1:100,000. Incision was made in the middle of crest and a conventional flap extending from the mesial tooth to the distal tooth related to the surgical site. Then, a full thickness buccal and lingual flaps were reflected to expose the site of

FIG (1) Preoperative radiographic assessment by CBCT (Axial cut shows narrow alveolar ridge width)

implant placement and obtain access and visibility to the subperiosteal surgical site. Ideally, this portion of the jaw should be relatively flat and smooth on top without any irregularities, therefore a round bur was used to reshape such irregularities, then identification of implant position, once the bone had been accessed. As a rule, for treatment option, all implants were submerged into the bone level.

A total of 20 Screw Two-Stage implant system were placed in the edentulous alveolar ridge. As a starting point for the implant site, small round bur was used to make a divot in the bone. Creating the pilot hole for the implant by pilot drill and Densah Burs progressively increased in diameter throughout the surgical procedure. These burs were designed to be used with standard surgical motors to preserve and condense bone at (800-1500 rpm) in a counterclockwise direction (Densifying Mode), and to precisely cut bone if needed (800-1500 rpm) in a clockwise direction (Cutting Mode). These Burs were used with copious irrigation in a Bouncing Pumping motion with minor vertical pressure to advance the drill into the osteotomy, then pulled

out for pressure relief, then advanced with vertical pressure again. The duration and number of bouncing-pumping episodes (in/out) were dictated by bone density and desired length. Once the hole has been properly shaped, dental implant was inserted into the jawbone. After implant installation the tension-free flap was repositioned in place using suturing material 3-0, followed by surgical pack for half an hour. The stitches were left in place for seven or ten days.

C- Postoperative phase

Post- operative instructions:

1- The patient was advised to avoid chewing hard food stuff at the implant site for 2 months.

2- Oral hygiene recommendations including the use of soft toothbrush.

Post-operative medication:

1- Amoxicillin (Augmentin) 1g tablets (t.d.s) for 5 days.

2- Ibuprofen (Brufen) 600 mg tablets (t.d.s) for 3 days.

All subjects were followed up immediately, three months and six months post operatively to assess their clinical conditions.

D- Follow up phase

CBCT was taken immediately, at 3 months and 6 months post operatively to detect marginal bone level, change in bone density around the implant and ridge width.

Statistical analysis

Data were represented as mean and standard deviation. Repeated measures analysis of variance (ANOVA) test was used to compare numeric variables. Post Hoc test was done if ANOVA or Friedman tests were positive. Using SPSS version in all tests, result was considered statistically significant if the p value was less than 0.05.

RESULTS

a. Bone Density:

The lowest mean value of bone density was recorded pre-operatively, no significant difference recorded between the mean pre-operative value and the value at 6 months post-operatively. The mean value increased immediately pre-operatively from 75.26±0.37 pre-operatively to 89.92±1.39 immediate post-operative to reach its highest level, then gradually decreased in the subsequent observation times from 84.67±1.98 at 3 months to 75.67±0.75 at 6 months.

b. Ridge width:

The lowest mean value was recorded pre-operatively, no significant difference between the mean immediate post-operative value, the value at 3 months, and the value at 6 months post-operatively. The mean value increased immediately pre-operatively from 4.37±0.58 preoperative to reach its highest level 6.84±0.67 immediate post-operative, was stable at 3 months 6.84±0.67, and then slightly decreased in the subsequent observation time 6.72±0.68 at 6 months Figure (2).

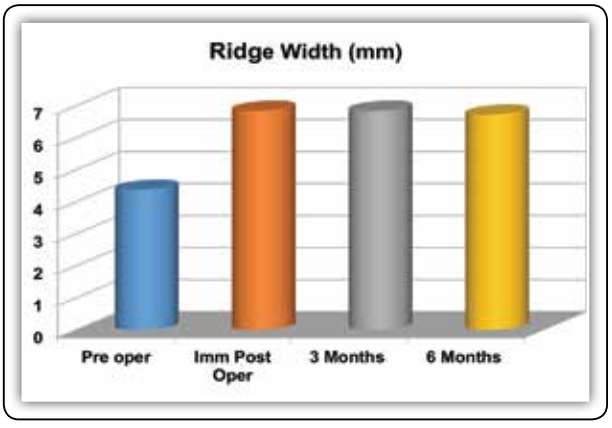

FIG (2) Bar showing mean ridge width in different observation times

c. Marginal bone loss:

The mean value gradually increased post-operatively from 0.00±0.00 immediate post-operative

to 0.18±0.15 at 3 months, to reach its highest mean value 0.43±0.28 at 6 months. Significant difference was recorded between the mean immediate post-operative value, the value at 3 months, and the value at 6 months post-operatively.

DISCUSSION

The current study was conducted that bone can be preserved by two ways: compaction of cancellous bone due to viscoelastic and plastic deformation, and compaction autografting of bone particles along the length and at the apex of the osteotomy. There are other osteotomy techniques that use compact bone through deformation and impaction autografting to improve its stability [10]. The philosophy of these techniques runs counter to the outcome of bone drilling, that healthy bone should be maintained, especially in regions where the density is already compromised.

In the current study, osseous densification increased the insertion torque to approximately 49 Ncm, from approximately 25 Ncm with the standard drilling technique. High insertion torque is particularly important in achieving a good clinical outcome with early or immediate loading. On the other hand, in soft bone Trisi et al [11] were not able to achieve more than 35 Ncm of peak insertion torque.

Increasing of the bone density in this study lead to increase the implant stability. As it depends on direct contact between the implant surface and the surrounding bone so that micromotions at this interface are reduced. The amount of micromotion is determined by the bone density around the implant [12]. In low-density bone, drilling procedure that remove bone inevitably leads to low insertion torque and further reduction in bone mineral density. In these cases, early loading of the implant will cause micromotion and may lead to a failed bone healing response [13]. Cancellous bone stiffness and strength are proportional to bone mineral density [14]. With reduced bone mineral density, there is a higher risk that the remaining bone will reach or exceed the bone microdamage threshold. If microdamage does occur, the bone remodeling unit may require 3 or more months to repair the damaged bone area [15].

The marginal bone loss that happened in this study was different among cases. All implants were showed to exhibit marginal bone loss at 6 months with a mean of 0.28 mm (maximum value 0.43 mm and minimum value 0.00 mm). Rungcharassaeng et al. [16] found that the marginal bone loss after 12 months follows up was 1.16-0.89 mm, Also Anastasios found 1.1-0.8 mm marginal bone loss around conical implants [17].

The design of densah burs allowed for simultaneous ridge expansion. This proved by measuring the ridge width immediately after implant placement. The ridge width remained the same after 6months, indicating that the thickness of the facial and palatal plates of bone remained the same after implant placement up to the end of the follow-up period. Also, Huwais et al., in 2013 reported similar results [9].

CONCLUSIONS

The outcome of the present study supports the use of Densah bur (Versah Drills) that based on biomechanical bone preparation technique called osseodensification and depend on compacted, autografted outward expanding directions from the osteotomy. Versah drills may allow expansion of the alveolar ridge bucco-lingually in an easier and less invasive way than the traditional surgical techniques. These burs can be used in cases with alveolar bone width less than 3 mm where the traditional ridge splitting technique is not indicated.

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