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Ahmed Bahaa Zidan
University of Ain Shams, ahmedbahaabahz@gmail.com

Hala Kamal
University of Ain shams, dr.halakamal@hotmail.com

Mohammed Wagdy
Mohamedbissar_1@yahoo.com

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Radiographic Analysis of Umbrella Technique Combined with Sticky Bone in Horizontal Ridge Augmentation

Ahmed Bahaa[a], Hala Kamal [b] and Mohammed Wagdy [c]

a. Master of Periodontology and Implantology, Faculty of Dentistry, Ain Shams University, Egypt .
b. Professor of Oral Medicine and Periodontology, Faculty of Dentistry, Ain Shams university, Egypt.
c. Lecturer of Oral Medicine and Periodontology, Faculty of Dentistry, Ain Shams university, Egypt.

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* Corresponding author.
E-mail address:
ahmedbahaabahz@gmail.com
(Ahmed Bahaa).

ABSTRACT

Aim: To evaluate the efficacy of umbrella technique combined with sticky bone in horizontal ridge augmentation using Buccolingual width changes measured in CBCT. **Materials and Methods:** 15 male and female Patients were selected . Buccal and lingual Infiltration anaethesia to mandibular posterior area (area of interest), crestal incision flap. Decortication using round bur and straight hand piece then drilling using screw drills with 90 degrees to the buccal cotical plate. Umbrella Screw insertion using screw holder with 6 mm length and 1.6 mm diameter where 3 mm inserted in the bone and 3 mm are kept outside. The bone graft and the I PRF are placed into sterile dish, mixed together till sticky bone is formed. Application of the sticky bone buccally, on and in between the bone screws with proper condensation. **Results:** At baseline, the mean radiographic bone width value was (3.31), the standard deviation was (0.87), the median was (3.75), and the interquartile range was (1.01). After 6 months, the mean was (6.08), the standard deviation was (0.78), the median was (6.33) and the interquartile range was (0.99). For the radiographic difference after 6 months, the mean value was (2.62), the standard deviation was (0.15), the median was (2.66) and the interquartile range was (0.20). For the percentage change the mean value was (76.30), the standard deviation was (11.25), the median was (72.94) and the interquartile range was (10.60). **Conclusion:** Umbrella technique using bone screws has predictable results in the horizontal ridge augmentation. Tenting of the periosteum and soft tissue using tenting screws maintains space and minimizes resorption of the particulate graft volume.

1. INTRODUCTION

If the teeth can't be restored or don't have an accepted function and esthetics. Thus extraction is the only treatment line. The loss of teeth disable the mastication, talking and socialization, so they have a direct effect on the life quality (Gerritsen et al., 2010). Moreovere, the missing of teeth in the alveolar bone stimulate different biological actions that form anatomical changes. (Van der Weijden et al., 2009).

Bone modelling occurs on both the buccal and lingual walls, but since the lingual bone wall is usually wider than the buccal one, therefore the vertical bone loss on the thin buccal plate is greater than that on the wide lingual wall. Moreover, bone modelling happens before the bone remodeling. Around two-thirds of the modelling process occurs in the first three months of recovery (Trombelli et al., 2008).

In different clinical cases of totally and partially edentulous patients, rehabilitation with dental implants in is a well-documented therapy. It can be unsuitable for some patients, especially if they lack the required volume of bone tissue for implant placement (Sanz-Sánchez I et al., 2018). Despite this, It is clear that usually these bone deficiencies can be corrected, so patients become reliable for implant-supported rehabilitation. (Autogenous grafts) bone-gaining donor sites or (homogeneous, xenogeneic, or synthetic grafts) bone replacements are used for this purpose (Zheng X et al., 2016).

I. Case description

A 35-year-old female patient with non-contributory medical history reported to the department with a chief complaint of missing lower left 2nd premolar, 1st molar and 2nd molar. When the patient was clinically examined there was sufficient inter arch height with thin horizontal alveolar ridge making placement of prosthesis is difficult . The patient was then given the option of ridge augmentation and implant placement. The patient was advised cone beam CT

(CBCT). The CBCT showed thin horizontal alveolar ridge and sufficient alveolar bone height. After discussing the treatment options with the patient, she agreed for horizontal ridge augmentation for implant placement after 6 months. Informed consent was obtained from the patient. A thorough scaling and root planning was performed 2 weeks prior to the surgery.

Bone augmentation (Stage 1):

Buccal and lingual Infiltration anaethesia to mandibular posterior area (area of interest), crestal incision flap using lancet with blade no. 15. The flap is released buccally and lingually, decortication using round bur and straight hand piece then drilling Umbrella Screws with screw drills with 90 degrees to the buccal cortical plate and inserted with screw holder with 6 mm length and 1.6 mm diameter where 3 mm inserted in the bone and 3 mm are kept outside.

5 cm blood sample is taken from the patient with plastic disposable syringe, The blood is inserted into collection Vaccutainer tube, another vacutainer tube filled with water, both are placed into the centrifugal force device in a balanced manner. This centrifuge is ideal for the separation of serum plasma and other blood samples. The Cen TrkinG device settings is adjusted at 1500 RPM for 2 minutes.

Bio/Oss bone graft with granules size 0.25 mm - 1mm 0.5 g. is used combined with I PRF then placed into sterile dish, mixed together till sticky bone is formed.

Application of the sticky bone buccally, on and in between the bone screws with proper condensation after that Simple interrupted sutures to the flap without tension with proper knote using sterile, synthetic, polypropylene monofilament suture 5-0. The Gauze is kept over the flap and the patient is given post-operative instructions.

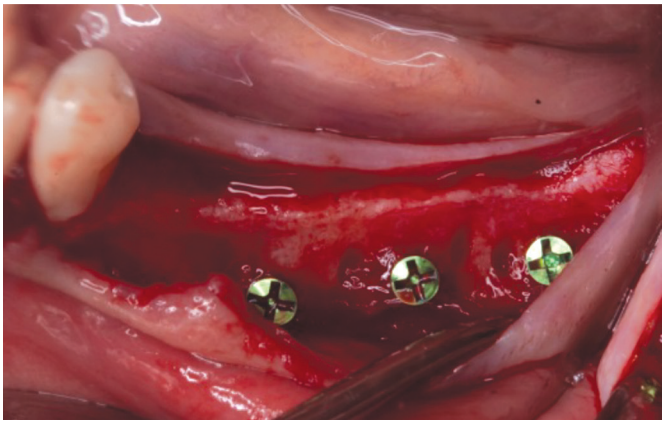


Figure (1) — Insertion of bone screws in the mandibular posterior area

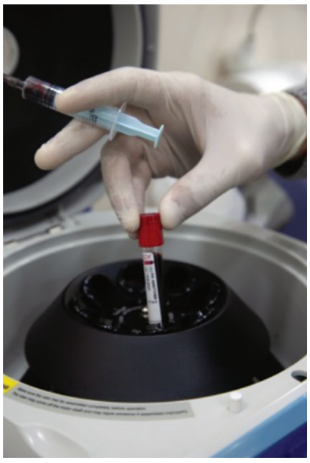


Figure (2) — Blood sample collection in vacutainer tube

Figure (3) — Application of the sticky bone buccally, on and in between the bone

Figure (4) — Simple interrupted sutures to the flap without tension with proper knote.

Implant placement (stage 2):

Infiltration buccal and lingual to the mandibular posterior area (area of interest), then crestal incision and the Flap is released buccally and lingually where the Screws are removed using screw holder. Drilling with implant drills then, 2 implant placement of roott company 3.5*10 and 4.2*8 at areas of 4 and 6 then flap closure without tension with simple interrupted sutures with proper knotes

Figure (7) — Occlusal view of inserted implants 4 and 6

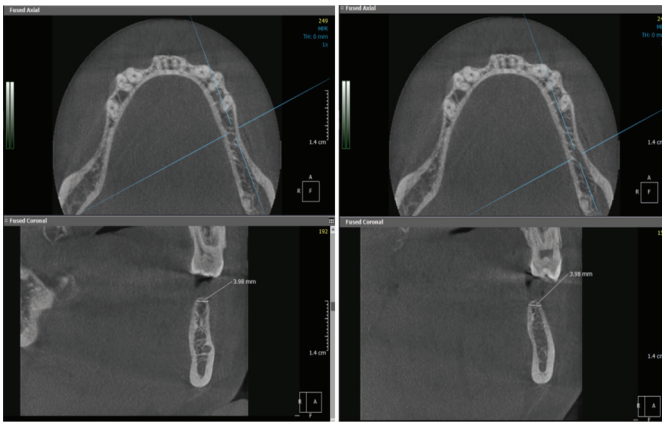
Statistical analysis

I- Radiographic analysis:

1- Cone beam CT

Case 1

- Pre Operative CBCT



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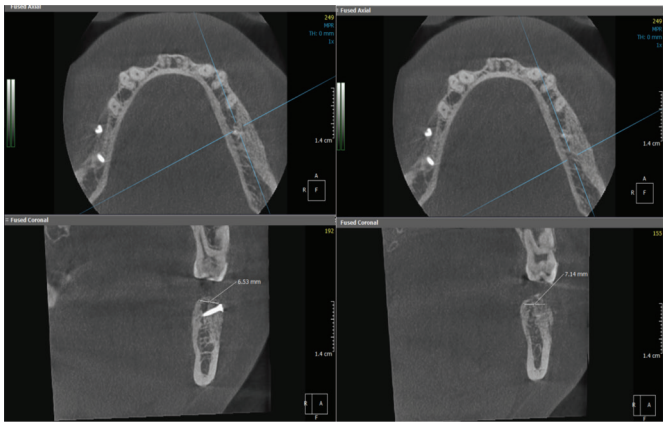
- **Post Operative CBCT**



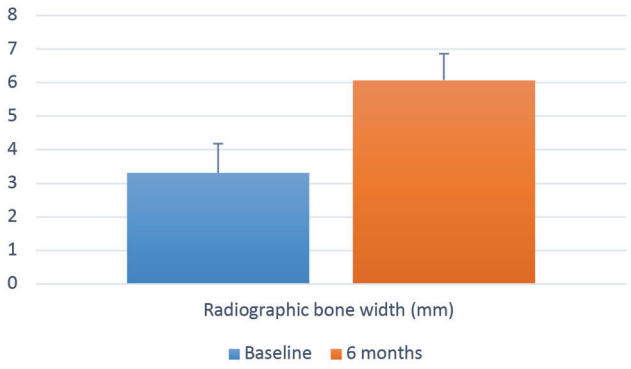


Figure (8) — Bar chart shows average radiographic bone width at different intervals

2- Descriptive statistics:

Descriptive statistics for radiographic bone width were presented in table (1)

At baseline, the mean radiographic bone width value was (3.31), the standard deviation was (0.87), the median was (3.75), and the interquartile range was (1.01). After 6 months, the mean was (6.08), the standard deviation was (0.78), the median was (6.33) and the interquartile range was (0.99).

For the radiographic difference after 6 months, the mean value was (2.62), the standard deviation was (0.15), the median was (2.66) and the interquartile range was (0.20). For the percentage change the mean value was (76.30), the standard deviation was (11.25), the median was (72.94) and the interquartile range was (10.60).

Table (1) Descriptive statistics for radiographic bone width

Measurement		Mean	Standard deviation	Median	Interquartile range
Radiographic bone width (mm)	**Baseline**	**3.31**	**0.87**	**3.75**	**1.01**
	6 months	**6.08**	**0.78**	**6.33**	**0.99**
Radiographic bone width difference (mm)		2.62	0.15	2.66	0.20
Radiographic bone width percentage change (%)		76.30	11.25	72.94	10.60

3- Intragroup comparison:

Intragroup comparison of radiographic bone width was presented in table (2) and in figure (8)

There was a significant increase of measured radiographic bone width after 6 months from (3.31±0.87) to (6.08±0.78) ($p<0.001$).

Table (1) Intragroup comparison of radiographic bone width

Radiographic bone width (mm) (Mean±SD)		t-value	p-value
Baseline	**6 months**		
3.31±0.87	6.08±0.78	18.97	<0.001*

**; significant ($p \leq 0.05$)*

2. DISCUSSION

In our current study we used the umbrella technique in the lower posterior area for the horizontal ridge augmentation.

The resorbtion of the alveolar ridge is a physiologic process that will not be prevented. Moreover, the missing of teeth in the alveolar bone stimulate different biological actions that form anatomical changes (Van der Weijden et al., 2009).

Ridge resorbtion can be categorized as a multifactorial phenomenon that is partially attributed to the loss of blood supply that is derived from the periodontal ligament (PDL) prior to tooth extraction, this phenomena appear in the mandible greater than maxilla which lead to significant dimensional changes during the immediate post-extraction period, like the concavities on the buccal surface of the ridge.

In the current study CBCT was used in our measurements, regarding (Mohan et al., 2011), in the periodontology, teeth assessment and the alveolar bone surrounding, depends mainly on the two dimensional imaging traditional modalities such as digital and conventional radiograph. Although these modalities are helpful and having less exposure of radiation, They can't recognize osseous three-dimensional (3D) architecture defects. (Mohan et al., 2011).

The descriptive statistics for radiographic bone width in our current study at baseline showed significant increase in the mean radiographic bone width, the standard deviation and the interquartile range was after 6 months compared to the pre-operative results with average 3 mm increase in bone diameter.

3. CONCLUSION

1. Umbrella technique using bone screws has predictable results in the horizontal ridge augmentation.
2. Tenting of the periosteum and soft tissue using tenting screws maintains space and minimizes resorption of the particulate graft volume.

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