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Original Research

Assessment of various methods of assessing residual alveolar ridge width prior to dental implant placement

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ABSTRACT:
Background: Dental implants have revolutionized contemporary dental treatment for the rehabilitation of missing dentition, replacing conventional therapies in the areas of complete and partial edentulism as well as for single tooth anodontia. The present study was conducted to assess various methods of assessing residual alveolar ridge width prior to dental implant placement. **Materials & Methods:** 30 patients with 46 edentulous sites of both genders. A thorough oral examination was carried out. The width of edentulous spaces was measured and compared by three methods: CBCT, bone mapping, and surgical exposure. **Results:** Out of 30 patients, males were 14 and females were 16. The mean bone width detected by CBCT was 6.87 mm, bone mapping was 6.91 mm and surgical method was 6.86 mm. The difference was significant (P< 0.05). **Conclusion:** CBCT and ridge mapping measurements when compared individually with the gold standard-surgical open method, CBCT proved to be a highly specific and sensitive method detecting the residual alveolar ridge width in the treatment planning of dental implants.
Key words: Dental implants, CBCT, Bone width

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INTRODUCTION

Dental implants have revolutionized contemporary dental treatment for the rehabilitation of missing dentition, replacing conventional therapies in the areas of complete and partial edentulism as well as for single tooth anodontia.[1] Bone evaluation limited to the use of panoramic and/or periapical radiographs may be insufficient because it only provides two-dimensional information about implant sites. Assessment of the bucco-lingual dimension of the osseous ridge also is needed for proper treatment planning. The bucco-lingual ridge width can be evaluated by computerized tomography (CT).[2] An alternative method is ridge mapping using a caliper device under local anesthesia. The pointed tips of the instrument penetrate buccal and lingual soft tissue layers and measure the bucco-lingual width of the underlying bone. This procedure is performed chairside and provides instant information. Ridge mapping may obviate tomographic imaging. To determine this, ridge mapping needs to be compared to what would seem to be the most accurate measurement, i.e., direct caliper measurements following surgical exposure of the bone.[3]

Several studies have shown that cone-beam computed tomography (CBCT) provides high quality, accurate cross-sectional images with relatively low dose exposure.[4] Before the introduction of CBCT, ridge mapping was one of the alternative methods for assessing the residual alveolar ridge. Direct caliper measurements following surgical exposure of the bone are the most accurate and can be considered as the "gold standard" to assess the bucco-lingual alveolar ridge width.[5] However, the flap reflection and measuring the residual alveolar ridge width after

surgical exposure is not feasible or advisable just for diagnosis and treatment planning of the dental implant.[6] The present study was conducted to assess various methods of assessing residual alveolar ridge width prior to dental implant placement.

MATERIALS & METHODS

The present study consisted of 30 patients with 46 edentulous sites of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. A thorough oral examination was carried out. The width of edentulous spaces was measured and compared by three methods: CBCT, bone mapping, and surgical exposure. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 30		
Gender	**Male**	**Female**
Number	14	16

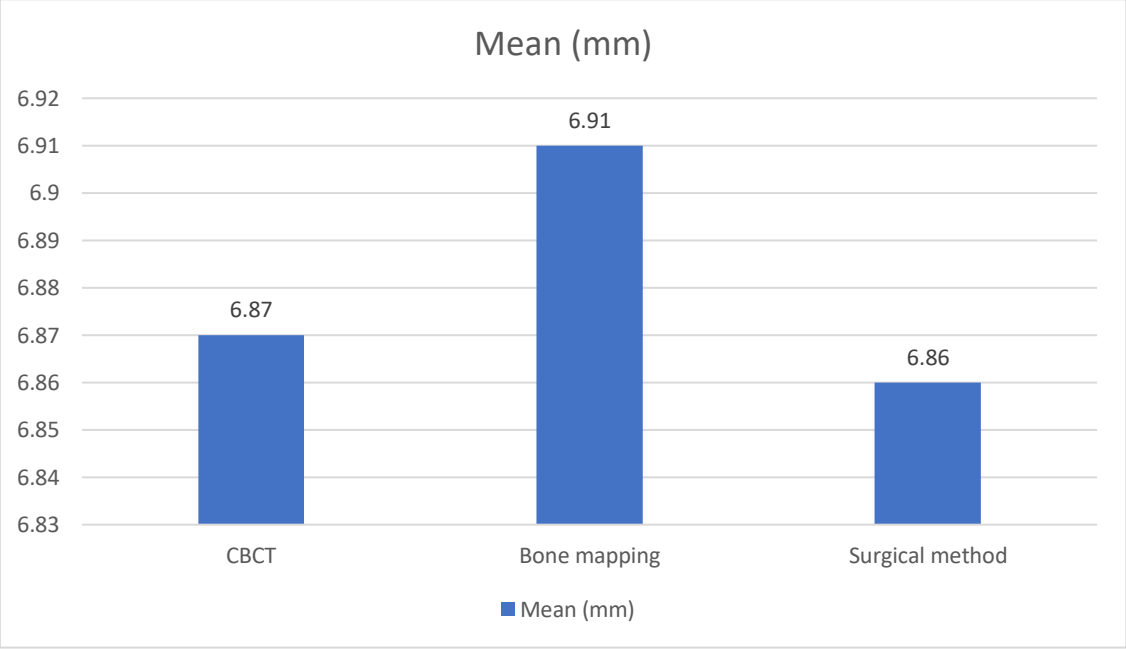
Table I shows that out of 30 patients, males were 14 and females were 16.

Table II Assessment of bone width

Method	Mean (mm)	P value
CBCT	6.87	0.05
Bone mapping	6.91	
Surgical method	6.86	

Table II, graph I shows that mean bone width detected by CBCT was 6.87 mm, bone mapping was 6.91 mm and surgical method was 6.86 mm. The difference was significant (P< 0.05).

Graph I Assessment of bone width



DISCUSSION

The goal of modern dentistry is to restore the patient to normal contour, function, comfort, esthetics, speech, and health.[7] What makes implant dentistry unique is the improved ability to achieve this goal. However, careful diagnosis and treatment planning are must for favorable outcome. Treatment planning for implants includes a through radiographic and clinical examination.[8] Evaluation of the dimensions of the available alveolar bone is an important prerequisite for dental implant placement. Bone evaluation limited to the use of panoramic and/or periapical radiographs may be insufficient because it only provides two-dimensional (2D) information about implant sites.[9] Advanced digital radiographic techniques such as "computed tomography (CT)" have now become the mainstay for preimplantation assessment. The introduction of cone beam (CB) CT, in 1998, provided a new form of three- dimensional (3D) evaluation.[10] The present study was conducted to assess various methods of assessing residual alveolar ridge width prior to dental implant placement.

We found that out of 30 patients, males were 14 and females were 16. Sutaria et al[11] evaluated the accuracy of cone beam computed tomography (CBCT) and bone mapping for the diagnostic purpose. A total of 27 partially edentulous sites in maxilla and/or mandibular arch were selected according to the mentioned criteria. The width of edentulous spaces was measured and compared by three methods: CBCT, bone mapping, and surgical exposure. Later, the obtained data were sent for statistical analysis to check the accuracy of methods for the assessment of residual alveolar ridge width prior to the dental implant placements. It shows that average measurements are significantly differ between surgical open method and bone mapping. CBCT measurement is almost same as surgical open method. Thus, out of CBCT and bone mapping methods, CBCT is significantly better.

We found that mean bone width detected by CBCT was 6.87 mm, bone mapping was 6.91 mm and surgical method was 6.86 mm. Chen et al[12] in their study sixteen subjects with 25 sites for planned implant placement or ridge augmentation were recruited. An acrylic stent was fabricated for each subject. The stent provided three buccal/lingual pairs of consistent measurement points for each implant site located 4, 7, and 10 mm from the summit of the alveolar soft tissue. Comparisons of bucco-lingual ridge width using ridge-mapping versus direct caliper measurements showed that 94% and 89% of the pairs of measurement deviations were within – 1 mm for examiners 1 and 2, respectively. The corresponding comparison of CBCT images versus direct caliper measurements showed 70% and 55% agreement for examiners 1 and 2, respectively. CBCT image measurements provided lower levels of agreement than ridge-mapping measurements because of the more frequent and larger magnitudes of deviations compared to direct caliper measurements.

Castro et al[13] compared the validity of alveolar ridge measurements obtained with ridge mapping (RM) technique against cone beam computed tomography (CBCT) measurements. Twenty partially edentulous patients were recruited for implant placement. For all the measurements, a vacuum-formed stent was fabricated for each subject. A buccal and lingual point was made in the stent to provide a reference of measurement for each implant site. RM measurements with the stent were obtained before and after surgical flap reflection. A total of 62 implants sites were evaluated. No statistical significant differences were obtained with CBCT and RM measurements (P = 0.207). Detecting proper buccal-lingual ridge, the sensitivity and specificity were 59% and 91% for RM while CBCT obtained 92% of sensitivity and 94% of specificity. Concordance was found “good” (ICC 0.82). Both methods provided valid measurements. It demonstrated to be a useful method for its exactitude, low cost, the immediate result and no need of radiation. CBCT was recommended when the bone ridge width and height were in the less than ideal for conventional dental implant placement.

The limitation the study is small sample size.

CONCLUSION

Authors found that CBCT and ridge mapping measurements when compared individually with the gold standard-surgical open method, CBCT proved to be a highly specific and sensitive method detecting the residual alveolar ridge width in the treatment planning of dental implants.

REFERENCES

1. Luk LC, Pow EH, Li TK, Chow TW. Comparison of ridge mapping and cone beam computed tomography for planning dental implant therapy. Int J Oral Maxillofac Implants 2011;26:70-4.
2. Veyre-Goulet S, Fortin T, Thierry A. Accuracy of linear measurement provided by cone beam computed tomography to assess bone quantity in the posterior maxilla: A human cadaver study. Clin Implant Dent Relat Res 2008;10:226-30.
3. Allen F, Smith DG. An assessment of the accuracy of ridge-mapping in planning implant therapy for the anterior maxilla. Clin Oral Implants Res 2000;11:34-8.
4. Cortes AR, Gomes AF, Tucunduva MJ, Arita ES. Evaluation of linear tomography and cone beam computed tomography accuracy in measuring ridge bone width for planning implant placement. Braz J Oral Sci 2012;11:116-9.
5. Anil Kumar N, Agrawal G, Agrawal A, Sreedevi, Kakkad A. Journey from 2D to 3D: Implant imaging. Int J Contemp Dent Med Rev 2014;26:1-5.
6. Wilson DJ. Ridge mapping for determination of alveolar ridge width. Int J Oral Maxillofac Implants 1989;4:41-3.
7. Engelman MJ, Sorensen JA, Moy P. Optimum placement of osseointegrated implants. J Prosthet Dent 1988;59:467-73.
8. Andersson B, Odman P, Lindvall AM, Brånemark PI. Five-year prospective study of prosthodontic and surgical single-tooth implant treatment in general practices and at a specialist clinic. Int J Prosthodont 1998;11:351-5.
9. Khindria SK, Mittal S, Sukhija U. Evolution of denture base materials. J Indian Prosthodontic Soc 2009;9:2.
10. Adell R, Lekholm U, Rockler B, Brånemark PI. A 15-year study of osseointegrated implants in the treatment of the edentulous jaw. Int J Oral Surg 1981;10:387-416.
11. Sutaria F B, Shah D N, Chauhan C J, Solanki J S, Bhatti K A. Comparative evaluation of various methods of assessing residual alveolar ridge width prior to dental implant placement: An in vivo study. J Dent Implant 2019;9:12-9.
12. Chen LC, Lundgren T, Hallström H, Cherel F. Comparison of different methods of assessing alveolar ridge dimensions prior to dental implant placement. Journal of periodontology. 2008 Mar;79(3):401-5.
13. Castro-Ruiz CT, Noriega J, Guerrero ME. Validity of ridge mapping and cone beam computed tomography in dental implant therapy. J Indian Soc Periodontol 2015;19:290-3.