Evaluation of various methods of assessing residual alveolar ridge before implant insertion

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ABSTRACT: Background: Treatment planning for implants includes a through radiographic and clinical examination. This study compared ridge mapping, direct surgical exposure and CT scan for alveolar ridge assessment before dental implant insertion.
Materials & Methods: The present study was conducted on 60 patients who were selected for dental implants placement of both genders. Patients were divided into 3 groups of 20 each. In group I, direct surgical exposure, in group II CT scan and in group III ridge-mapping procedure was performed at 3 mm and 6 mm from alveolar crest.

Results: The mean measurement of alveolar ridge at 3 mm in group I was 3.92 mm, in group II was 4.02 mm and in group III was 3.90 mm. The difference between groups was non- significant (P> 0.05). The mean measurement of alveolar ridge at 6 mm in group I was 6.46 mm, in group II was 6.54 mm and in group III was 6.44 mm. The difference between groups was non- significant (P> 0.05).

Conclusion: Authors found that all the methods revealed similar results hence any of these methods may be used in alveolar ridge assessment before inserting dental implants.

Key words: Alveolar ridge, Dental implants, Ridge mapping

1. INTRODUCTION

The goal of modern dentistry is to restore the patient to normal contour, function, comfort, esthetics, speech, and health. What makes implant dentistry unique is the improved ability to achieve this goal. However, careful diagnosis and treatment planning are must for favorable outcome.[1] Dental implant therapy is gaining importance day by day as the treatment of choice in cases of rehabilitation of missing dentition, complete and partial as well as for single missing tooth.Treatment planning for implants includes a through radiographic and clinical examination. An important and challenging step in implant dentistry is the accurate planning and placement of the dental implant which yields a successful outcome and also prevents encroachment on vital structures.[2]

Evaluation of the dimensions of the available alveolar bone is an important prerequisite for dental implant placement. Evaluating bone with periapical radiographs and panoramic ones has limitations as they are providing 2 Dimensional (2D) information of implant site.CT scan is another useful method of alveolar ridge assessment.[3]

In order to assess residual alveolar ridge, previously ridge mapping was an option. The "gold standard method to assess width of the ridge in bucco- Lingual Direction is by surgical exposure of the bone followed by Direct caliper measurements.[4] However, surgical exposure for diagnosis is not advisable. This study compared ridge mapping, direct surgical exposure and CT for alveolar ridge assessment before dental implant insertion.

2. MATERIALS & METHODS

The present study was conducted in the department of prosthodontics. It comprised of 60 patients who were selected for dental implants placement of both genders. They were informed regarding the study and written consent was obtained. Ethical clearance from ethical committee was taken prior to the study.

Data such as name, age, gender etc. was recorded. Patients were distributed in 3 groups with 20 patients in each group .In group I, direct surgical exposure, in group II CT scan and in group III ridge-mapping procedure was performed at 3 mm and 6 mm from alveolar crest.Data was subjected to statistical analysis. P valueless than 0.05 was considered significant.

3. RESULTS

Table I Distribution of patients

Groups	Group I	Group II	Group III
Methods	Direct surgical exposure	CT scan	Ridge mapping
Number	20	20	20

Table I shows method of alveolar ridge assessment in all three groups.

Table II Comparison of alveolar ridge assessment at 3 mm

Distance	Mean (mm)	P value
Group I	3.92	0.81
Group II	4.02	
Group III	3.90	

Table II, graph I shows that mean measurement of alveolar ridge at 3 mm in group I was 3.92 mm, in group II was 4.02 mm and in group III was 3.90 mm. The difference between groups was non- significant (P> 0.05).
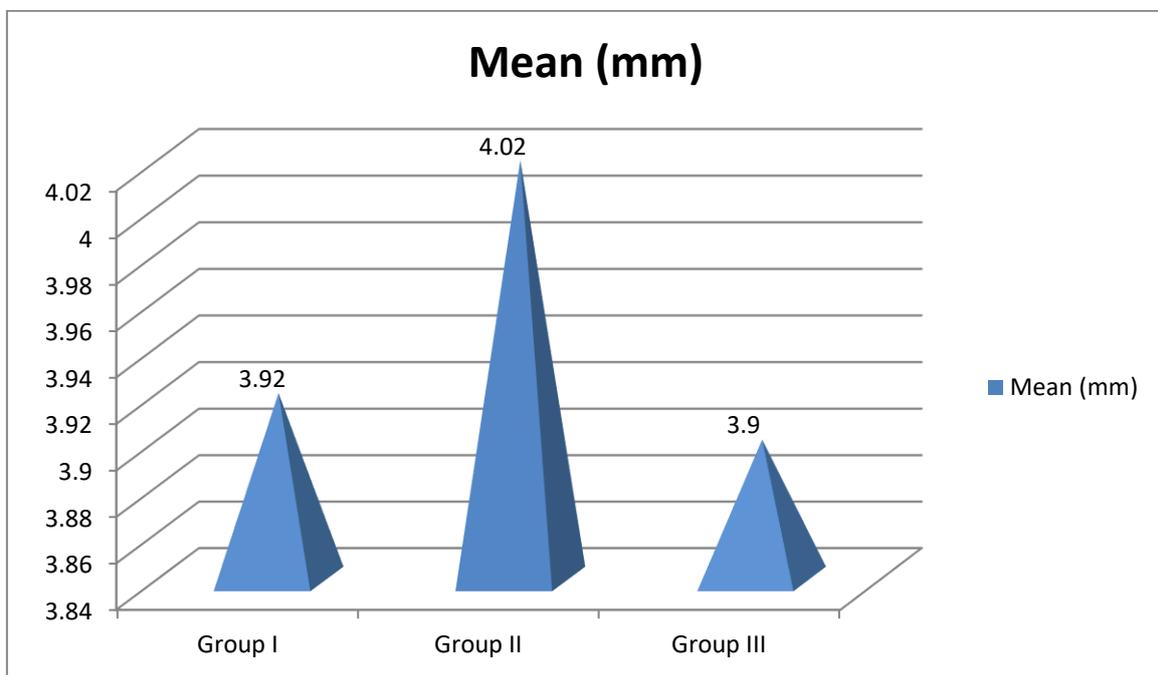
Graph I Comparison of alveolar ridge assessment at 3 mm

Table III Comparison of alveolar ridge assessment at 6 mm

Distance	Mean (mm)	P value
Group I	6.46	0.92
Group II	6.54	
Group III	6.44	

Table III, graph II shows that mean measurement of alveolar ridge at 6 mm in group I was 6.46 mm, in group II was 6.54 mm and in group III was 6.44 mm. The difference between groups was non- significant (P> 0.05).

Graph II Comparison of alveolar ridge assessment at 6 mm
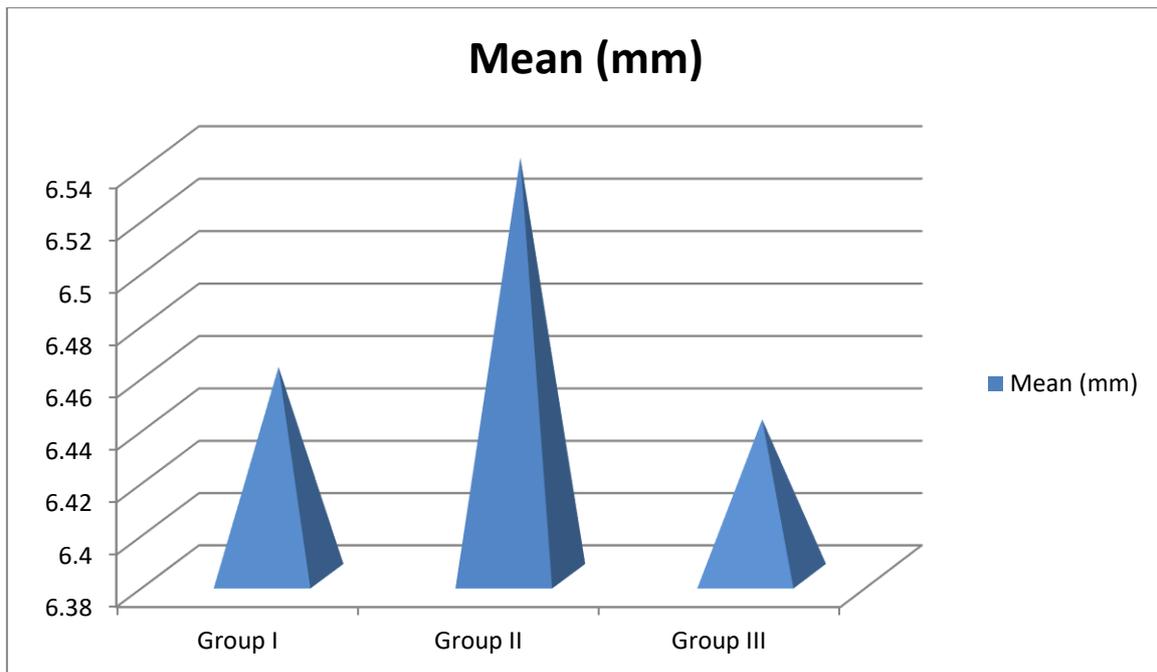
4. DISCUSSION

The implants placement requires careful planning and vigilant surgical protocols .In order to assure proper positioning of the implant,the contour of the residual bone has to be properly evaluated in prior .The contour can be observed using study models along with diagnostic wax-up. Another important step in planning process is to decide the surgical method for implant placement.[5]The conventional ridge mapping techniques have been replaced by more advanced and latest bone imaging techniques. Cross-sectioned imaging can be achieved using computerized tomography; however, significant differences in bone height measurements have been shown to occur in comparisons of panoramic radiography and two-dimensional orthoradially formatted CT images. Cumulative radiation dose to the head and neck area, the possibility of a image distortion due to metallic tooth restorations and/or patient movement, and greater cost are the problems associated with this technique[6]This study compared ridge mapping, direct surgical exposure and CT for alveolar ridge assessment before dental implant insertion.

In this study, Patients were divided into 3 groups of 20 each. In group I, direct surgical exposure, in group II CT scan and in group III ridge-mapping procedure was performed at 3 mm and 6 mm from alveolar crest. Chugh et al[7]conducted the study on 20 patients who reported for replacement of edentulous span with dental implant. Width of alveolar ridge was studied by three techniques, i.e. CT scan , ridge mapping, and surgical exposure at two points (3 mm from the crest of ridge and 6 mm from the crest of ridge), and measurements of surgical exposure was taken as the control group, the accuracy of these methods were assessed by comparing the measurements obtained from other two techniques. No significant difference in the measurements was obtained by three techniques.

We found that the mean measurement of alveolar ridge at 3 mm in group I was 3.92 mm, in group II was 4.02 mm and in group III was 3.90 mm.Sutaria et al[8] in their study a total of 27 partially edentulous sites in maxilla and/or mandibular arch were selected. Three different methods were used to compare width of edentulous space. These were CBCT, bone mapping, and surgical exposure. Data obtained were subjected to statistical analysis to check the accuracy of methods and results showedstatistically significant difference between the variables.

We observed that the mean measurement of alveolar ridge at 6 mm in group I was 6.46 mm, in group II was 6.54 mm and in group III was 6.44 mm. Wilson[9]concluded that ridge mapping isnot comparable to a full surgical flap reflection,howevera simple and effective method of measuring alveolar thickness prior to surgery. Allen and Smith[10]concluded that ridge-mapping alone is not sufficient enough to precisely predict the bone availability for implantation in the anterior maxilla. Veyre-Goulet[11] also concluded, CBCT images are reliable to define the bone volume of the posterior maxilla to plan the implant axis,although density of cadaver bone may not correspond to that of vital bone

Lam et al[12]suggested that the use of CT imaging for assessing bucco-lingual bone dimensions is usefulhowever problems such asprolonged time to produce image(20-25 min), the cumulative radiation dose to the head and neck area, and the possibility of image distortion with metallic tooth restorations and/ or movementby the patient and higher cost are common.

The limitation of the study is small sample size.

5. CONCLUSION

Authors found that all the methods revealed similar results hence any of these methods may be used in alveolar ridge assessment before inserting dental implants.

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