

## ORIGINAL RESEARCH

# Realibility of Intra Oral Periapical Radiograph in Occlusal Projection for Evaluating Pre Implant Surgical Site – A Clinical Study

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## ABSTRACT

**Introduction:** Pre Implant Surgical site assessment is an integral part of Implant dentistry. One such key component of the evaluation is the available dimensions of the Buccolingual width for the implant placement. Thus, the aim of this *in vivo* study was to determine the buccolingual dimensions of ridge/width of bone using Intra Oral Periapical Radiographs (IOPA) in occlusal projection as a pre implant surgical site evaluation method.

**Materials and Methods:** 15 patients opted for implant prosthesis were selected in this study. The preoperative IOPA radiographs were taken in the occlusal projection. Intraoperative bone width was measured using digital vernier caliper and the same width was compared with IOPA radiograph using same caliper and the distances were recorded.

**Results:** Comparisons of Bucco-lingual bone ridge width using Radiographical measurement versus Intraoperative method showed a mean value of 4.967 and 4.633 respectively ( $P=0.4972$ ) and the reliability of the test was calculated using Pearson correlation coefficient which was found to be 0.995.

**Conclusion:** The findings in this study suggested that IOPA radiographs in occlusal projection can be used as a preprosthetic diagnostic method to assess the width of the mandibular ridge width for implant placement.

**Keywords:** Bone ridge width, intra oral radiography, implant site evaluation

**How to cite this article:** Akhilesh Shewale, Deepti Gattani, Sonali Akhade, Yogesh Rathod, Rupali Mahajan. Realibility of intra oral periapical radiograph in occlusal projection for evaluating pre implant surgical site – a clinical study. International Journal of Contemporary Medical Research 2015;2(5):1186-1189.

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**Source of Support:** Nil

**Conflict of Interest:** None

## INTRODUCTION

With the advent of Dental implants as a treatment modality for rehabilitating edentulous mouth ever since 1960's it has now become a significant treatment option in restorative dentistry whereas its long-term success rates are reported to approach around 95% or even more. However, the success of dental implant lies in its well constructed pre treatment evaluation of the surgical site. One of the main pre requisite in pre treatment evaluation was to measure the available bone width or height for implant placement.

The width of the bone available for implant placement plays an important role in its future success. It is recommended that the minimum available bone width should be at least  $\geq 1$  mm around the placed implant. This width keep the soft tissue levels stable and this distance is more critical on the buccal side since any bone resorption and ensuing change in the position of the gingival margin will be nonesthetic.<sup>1</sup> Thus it is necessary to evaluate the bone width presurgically. Assessment of ridge width can be performed by various methods including computerized tomography (CT),<sup>2</sup> Ridge mapping,<sup>3</sup> Trans Tomography,<sup>4</sup> Ultrasound measurement,<sup>5</sup> Occlusal Radiography,<sup>6</sup> Direct Caliper Measurements following surgical exposure of the bone.<sup>7</sup>

However the above methods require expensive instrumentation, surgical exposure of bone, more radiation exposure to patient and technique sensitive lab procedures. Although conventional panoramic and IOPA radiographs produce two-dimensional image, advantages are that they provide information about length of bone, visualization of nerves and vessels, but do not provide information regarding width of bone about implant sites.

So, the aim of this *clinical* study was to evaluate the dimensions of ridge/width of bone using Intra Oral Periapical Radiographs (IOPA) in occlusal projection and check its reliability as a diagnostic imaging tool for pre implant surgical site evaluation.

## MATERIALS AND METHODS

The study protocol was reviewed by the Ethical Commit-

tee of Swargiya Dadasaheb Kalmegh Smruti Dental College and Hospital and was granted ethical clearance followed by which This study was carried out in Department of periodontology of Swargiya Dadasaheb Smruti dental college and hospital.15 patients were selected from OPD reported to the department with the complaint of missing teeth and required fixed prosthesis for the same and opted for Implant as their treatment of choice.After explaining the study protocol, an informed consent was taken from the selected patients prior to the start of the procedure.

**Inclusion Criteria**

Patient having edentulous space in mandibular ridge

**Exclusion Criteria**

- a) Pregnant patients, b) Patient with Uncontrolled Diabetes,
- c) Patient contraindicated for radiation

**CLINICAL PROCEDURE**

After initial Preparation and maintaining Strict surgical asep-sis, A local anesthesia(Lignox 2%, Warren™)was infiltrated prior to start of the surgery.A transcrestal incision was given between two adjacent teeth followed by which a full thickness mucoperiosteal flap was reflected and bone was completely denuded of the attached periosteum. The buccolingual ridge width was measured from outermost bony protruberances of buccal and lingual bone as seen in the fig.1C using digital verniercaliper.The distance of edentulous space between the adjacent teeth was measured using UNC -15 probe and the

same distance was calculated radiographically.

**Radiographic procedure**

The procedure were carried out by same operator to reduce the bias due to intraoperator variability. The patients were asked to bite on the IOPA radiograph from the evaluation site (FIG 2A)followed by which their heads were tilted parallel to the floor (FIG 2B). Now the projection head of the x-ray unit (Dent -X, Meditrix™)was kept perpendicular to the IOPA radiograph film.(Fig 3). In this position, the radiograph was taken (65 kVp – 0.5 sec.) The Film was then kept on a IOPA viewer and the bucco lingual width was measured using the same Digital vernier caliper used during clinical procedure as shown in the picture below. (Fig 2C).

**Radiographic Interpretation**

The Intra oral periapical radiograph (Fig.3) taken in occlusal projection shows the edentulous span between two adjacent teeth. Red line describes the width of bone crest whereas the Blue line describes the maximum possible width of the mandible around its total length.

**STATISTICAL ANALYSIS**

The statistical analysis was carried out using Graphpad prism 6.0 software. A two tailed P value was calculated using Student unpaired t-test. The two-tailed P value equals 0.4972. The mean of Group A minus Group B equals -0.3033.The Intermediate values used in calculations were t = 0.6878,

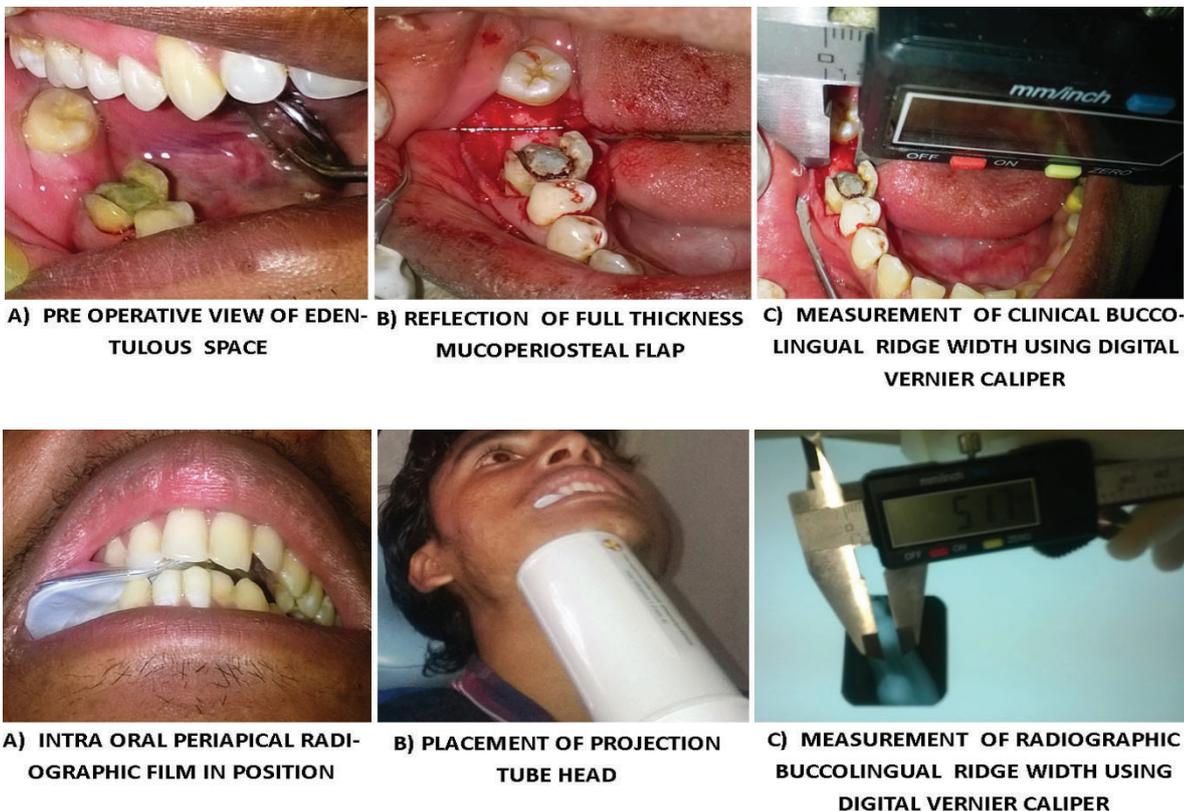




Figure-3: Intra oral periapical radiograph in occlusal projection

Patient No.	Clinical width (mm)	Radiographic width (mm)
1	4.94	5.17
2	2.37	2.61
3	6.23	6.87
4	5.44	5.71
5	4.27	4.56
6	3.13	3.48
7	5.68	5.89
8	3.89	4.27
9	6.54	6.89
10	5.88	6.14
11	3.76	3.92
12	4.62	4.87
13	3.49	3.77
14	4.54	4.83
15	4.72	5.07
Mean	4.633 ± 1.18	4.967 ± 1.22

**Table-1:** Mean bone width of mandibular ridge

Df = 28 and standard error of difference = 0.441. The reliability of the test were calculated using Pearson correlation Coefficient in microsoft excel 2010 Software and it was found to be 0.995

## RESULTS

The results showed the mean bone width of mandibular ridge in Group A and Group B were 4.6333 and 4.9367 respectively (Table 1). The P value of 0.4972 suggests non significant difference between the two Groups. Also the correlation between the scores of two groups taken from respective Z scores was 0.995 which is suggestive of high correlation between the measurement scores of two groups.

## DISCUSSION

The present *in vivo* study was done to assess the width of bone/dimensions of alveolar ridge using intra oral radiography in occlusal projection compared with that in intra surgical procedure.

The following radiographic projection technique has been employed in conventional occlusal radiograph for measuring bone width however the use of IOPA radiograph over occlusal radiograph in measuring bone width with this projection will have an added advantage of less superimposition of adjacent structures, prevent gag reflex, easily available, cost effective and give more precise details of area of interest.

Cone beam computed tomography (CBCT) has been widely used for assessing bone dimensions, however increase cost and greater radiation exposure can reduce its use. Also the recent statement by American academy of oral and maxillo-facial radiology (2012)<sup>8</sup> does not recommend use of CBCT for initial examination of pre surgical implant site and suggested use of intraoral periapical radiography to supplement the preliminary information from panoramic radiography.

Thus to overcome the cost burden on patients the present clinical study was designed to evaluate the reliability of suggested technique over the other available conventional techniques. Till now the available literature on this method was an *in vitro* study by S.Desai et al (2013)<sup>9</sup> in which the author using an prosthetic cast model suggested that IOPA radiographs taken in occlusal projection can be used as a preprosthetic diagnostic method to assess the width of the alveolar bone for future flapless implant placement. whereas in an other *ex vivo* study by N jameel and O.M Ibrahim (2014)<sup>10</sup> the authors using dry skulls suggested that the longitudinal topographic occlusal radiographs gives accurate measurements of alveolar bone thickness in the simple and uncomplicated implant cases of the proposed posterior implant sites.

As far as the authors knowledge this is the first clinical study to measure the bone width of mandibular ridge using the IOPA radiograph in occlusion projection against the traditional intra surgical measurement. The limitations of this method were 1) Site specificity : This method is cannot be applied on maxillary ridge due to presence of hard palate causing superimposition of structures. 2) too long edentulous span cannot be judged using single IOPA radiograph.

Keeping in mind the ALARA principle for radiation exposure, this technique offers much less radiation exposure to the patient than any other available radiographic imaging modalities and combining this technique with the routine IOPA technique can provide the clinician a three dimensional image of available pre surgical site and can be considered as one of the diagnostic weapon in its arsenal of available imaging modalities.

## CONCLUSION

The presented projection technique with IOPA radiograph along with the routinely used projection method for IOPA radiograph can be considered as a more precise pre surgical diagnostic imaging tool owing to its inexpensiveness and chair side availability. However, a study with a much larger sample size is required to show its accuracy.

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