



"EVALUATION OF BUCCAL BONE THICKNESS IN MAXILLARY ANTERIOR TEETH USING CBCT FOR IMPLANT ASSESSMENT"

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Abstract

7282

Aim: To evaluate buccal bone thickness anterior to Nasopalatine canal in maxillary central incisor region in male and female for implant assessment.

Material and method: The Buccal bone thickness was measured on sixty CBCT scans in sagittal section, measured at three level upper level, middle level, lower level (30 males & 30 females). The data was tabulated and subjected to statistical analysis to determine the correlation to gender.

Result: We found a significant difference between alveolar bone width anterior to the canal in the upper third, alveolar bone width anterior to the canal in the middle third, and gender, with males outnumbering females by 0.40 and 0.86, respectively, and no significant difference between alveolar bone width anterior to the canal in the lower third.

Conclusion: The current study provides useful data on the thickness of buccal walls in the aesthetic maxillary central incisor region as a preoperative analysis for establishing an immediate implant treatment plan for aesthetically pleasing long-term outcomes. Because resorption of the buccal plate is more severe when the walls are first thinner, it is more likely to affect the anterior regions than the posterior ones. CBCT is the most effective method for avoiding compromises in cosmetic reconstruction.

Keywords: Implant, Nasopalatine canal, Aesthetic, Buccal bone width.

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Introduction: Implant surgery is the most common treatment for missing teeth in

dentistry. For patients who are either partially or completely edentulous, implant placement is currently a treatment option. A favourable



outcome after implant insertion and restoration relies greatly on the diagnosis and treatment plan. A thorough dental history, photos, study models, panoramic and periapical radiographs, and CBCT of the potential implant sites should all be taken into account when assessing a patient for dental implants.^[1]

Treatment complications can lead to challenging clinical circumstances that can only be managed by retrieving the implant. Prior to placing dental implants, the morphology and size of the bone structures in the anterior maxillary area should be thoroughly evaluated in view of these possible difficulties.^[2]

In terms of aesthetic outcomes, bone thickness of the alveolar bone anteriorly is critical for dental implant therapy. Following tooth extraction, the buccolingual and apical-coronal extent of the alveolar region will be significantly reduced, which may affect the placement of an implant-supported crown in the aesthetic zone.^[3]Cone beam computed tomography (CBCT) is essential for comparing the benefits of the bony components surrounding the teeth to older techniques. This technology has the advantages of high resolution, non-invasiveness, low radiation dosage, and low cost.

Material and method: A total of 60 CBCT Scans of 30 male and 30 female with no pathology were randomly chosen aged 15–65 years.

Inclusion criteria:

1. CBCT scans of dentulous and edentulous patients of anterior maxillary region.
2. CBCT Scans with Age >18-<65 years.

Exclusion criteria:

1. CBCT scans with anomalies of Nasopalatine canal and in maxillary anterior region.
2. CBCT of patients who have obvious craniofacial changes or asymmetries.

Method: Measurement of buccal bone thickness or width was done in sagittal section of scans in three planes ⁽⁴⁾

Upper third at nasal level anterior to Nasopalatine canal

Middle third at mid level to Nasopalatine canal

Lower third at the incisal portion of tooth anterior to nasopalatine canal as shown in Figure 1.

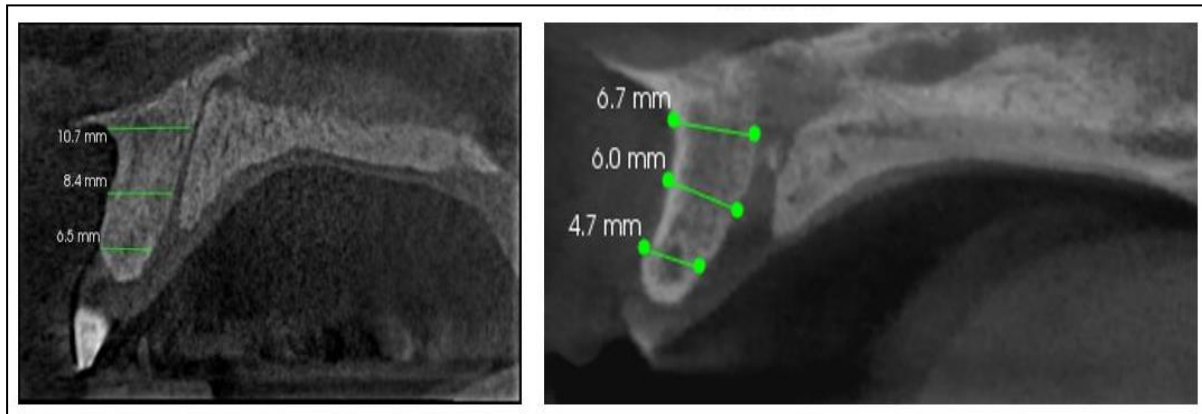
Results: Total 60 scans (40 male and 30 female) were analysed in sagittal section and statistical analysis was done by using SPSS software .The mean value for alveolar bone width anterior to canal in upper third between male and female is 8.3 and 7.5 respectively and the mean value for alveolar bone width anterior to canal in middle third between male and female is 6.5 and 5.5 respectively and the mean value for alveolar bone width anterior to canal in lower third between male and female is 5.6 and 5.5 respectively as shown in (Table 1)

We found a significant difference between alveolar bone width anterior to the canal in the upper third, alveolar bone width anterior to the canal in the middle third, and gender, with males outnumbering females by 0.40 and 0.86, respectively, and no significant difference between alveolar bone width anterior to the canal in the lower third.

Table 1: Shows the mean and standard deviation between male and female

BUCCAL BONE THICKNESS ANTERIOR TO NPC					
	Gender	N	Mean	Std. Deviation	Std. Error
UPPER	Male	30	8.310	1.8102	.3305
	Female	30	7.597	1.7407	.3178
MIDDLE	Male	30	6.537	1.2353	.2255
	Female	30	5.550	1.0592	.1934
LOWER	Male	30	5.627	1.1307	.2064





Discussion: Implant surgery is now the most common treatment for missing teeth in dentistry. According to related research, a positive bone state leads to greater osseointegration and a longer lifespan of dental implants; thus, a preoperative examination of the bone health of jaw is required.⁽⁵⁾⁽⁶⁾

The current study used CBCT to investigate bone thickness in implantation sites as a pre-surgical assessment for the buccal wall thickness or width, which has been shown to be useful for patients in previous studies using the same technology.⁽⁷⁾⁽⁸⁾ CBCT has become the industry standard for implant position planning, particularly in the aesthetic zone. If the alveolar bone atrophy determined by CBCT is severe, an augmentation surgical procedure may be required to enhance the bone around the dental implant⁽⁹⁾. The labial cortical plate in the anterior maxillary region is thinner than the palatal bone, and resorption occurs more easily after tooth extraction⁽¹⁰⁾.

According to a prospective study of single immediate implant placement in the maxillary anterior region, mid-buccal bone recession was about 0.5 mm after the first year of dental implantation⁽¹¹⁾. Furthermore, excessive force applied to a thin buccal plate by implant insertion may result in microfractures and crestal bone loss. As a result, it is critical to ensure the presence of hard tissues in order to perform the implantation process without serious complications by selecting the appropriate implant site and angling in the alveolar bone.

Although the geometric characteristics of measurements differed between these studies, Bronstein et al.⁽²⁾ and Fernández-Alonso et al.⁽¹²⁾ reported that gender affects buccal bone plate. Our findings were consistent with theirs in this regard. Some studies looked at how the presence or absence of maxillary anterior teeth affected the width of the buccal bone plate.^(13,14,15) They stated that missing maxillary anterior teeth would result in a significant reduction in buccal bone plate width. All measurements in this study were taken on dentate upper jaws. Because upper central incisors play such an important aesthetic role, most people prefer to replace them with immediate implants.⁽¹⁶⁾ As a result, there will usually be no time for bone resorption, and normal dentate relationships should be taken into account. Safi et al.⁽¹⁷⁾ found the effect of gender on measured dimensions of width of the buccal bone plate over the oral opening (A4) were significantly higher in males as compared with females. This is in agreement with Acar and Kamburoğlu.⁽¹⁸⁾ According to study conducted by Mehrdad et al. showed that incisive foramen sagittal diameter and alveolar bone width anterior to the canal in the upper and lower thirds were significantly different between men and women. But there were no significant differences in alveolar bone width anterior to the canal in the middle third our results showed significant difference at upper and middle level bone width.

Koç et al.⁽¹⁹⁾ and authors of other studies^(20,21) concluded a coinciding view with the present finding, indicating a steady increase in



thickness in an apical direction. The finding was also consistent with that of Deguchi et al.⁽²²⁾, who discovered that the thickness of cortical bone increases with height and decreases with depth. For central incisors, the BBT was thicker at the apex and thinner at the crest. This provides insight into the thickness, reducing the risk of implant complications, as stated by Prakash et al.⁽²³⁾. Another publication mentioned that the alveolar width of the central incisor diminished from the apical to crest direction ⁽²⁴⁾, which is in line with the current work.

In contrast, Altarawneh et al. ⁽²⁵⁾ reported that the mean measure of labial plates decreased towards the apical portion. This discrepancy might be attributed to the characteristics of the included cases as well as the different measuring depth used.

Conclusion: The current study provides useful data on the thickness of buccal walls in the aesthetic maxillary central incisor region as a preoperative analysis for establishing an implant treatment plan for aesthetically pleasing long-term outcomes.

Because resorption of the buccal plate is more severe when the walls are first thinner, it is more likely to affect the anterior regions than the posterior ones. CBCT is the most effective method for avoiding compromises in cosmetic reconstruction ⁽²⁶⁾. It enables multiple measurements at multiple sites as well as the existing bone property ⁽²⁷⁾. The study had some limitations, one of which was the age effect. Several outcomes may not be applicable to people of other ethnicities. Finally, CBCT readings may produce significant inaccuracies and overestimations when the bone plate is extremely thin.

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