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Evaluation of the buccal bone thickness in the anterior maxillary region using cone-beam computed tomography

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Abstract

Aim: This study aimed to analyze the buccal plate thickness of maxillary anterior teeth using cone-beam computed tomography (CBCT) images.
Methodology: This study involved a retrospective analysis of CBCT images from 104 randomly selected patients aged 20-50 years who had not experienced loss of their maxillary central and lateral incisors and canine teeth. The bone thicknesses of six anterior maxillary teeth were measured at 1 mm, 3 mm, and 5 mm distances apical to the alveolar bone crest (ABC) and between the cemento-enamel junction (CEJ) and ABC for six anterior maxillary teeth. The association between buccal bone plate width and distance from the CEJ to the ABC was examined across genders and among different age groups.
Results: The mean buccal bone thicknesses were 1.13 mm, 1.22 mm, and 1.04 mm at distances of 1 mm, 3 mm, and 5 mm, respectively. The mean distance from the CEJ to the ABC was 2.09 mm. A negative correlation was observed between age and the distance from the CEJ to the ABC. No correlation was found between buccal bone thickness and gender, and a negative correlation existed between age and buccal bone thickness. Women displayed a significantly lower distance from the CEJ to the ABC compared to men, and a negative correlation between buccal bone thickness and distance from the CEJ to the ABC was present across all tooth groups.
Conclusion: This study revealed that the bone width in the maxillary anterior region was remarkably thin. Therefore, achieving the minimum bone thickness of 2 mm necessary for optimal aesthetic and functional outcomes is seldom feasible in this area. Considering these findings, additional research utilizing larger patient cohorts is essential to fully comprehend how age and gender affect buccal bone thickness and CEJ-ABC distance. Additionally, utilizing preoperative CBCT for radiographic analysis to identify risk factors and select the appropriate treatment approach is strongly recommended.

Keywords: Buccal bone thickness, maxillary anterior teeth, alveolar bone crest, cemento-enamel junction, cone-beam computed tomography

Introduction

Partial or complete tooth loss can significantly impact an individual's quality of life and overall health (1). In recent decades, the use of dental implants in place of missing teeth has gained popularity. A precise three-dimensional placement of the dental implant is crucial for its success (2). The maxillary anterior region, in particular, requires thorough examination before implant placement because the dimensions and shape of the alveolar crest directly influence implant positioning, aesthetic outcomes, and implant stability (3). Unfortunately, the bone in the maxillary anterior area is quite thin, making it rarely suitable for achieving an optimal bone thickness of 2 mm, which is necessary for both aesthetics and functionality. Additionally, this region primarily consists of bundle bone, which leads to resorption of the alveolar bone crest and vertical bone loss (4).

While medical computed tomography (CT) has proven effective in imaging the maxillofacial region, its use in dentistry is limited due to its high cost and significant radiation exposure. Cone-beam computed tomography (CBCT), on the other hand, is a valuable tool for imaging the hard tissues of the head and neck, offering sub-millimeter resolution, high-quality diagnostic images, and lower radiation exposure compared to medical CT. CBCT provides detailed information about the alveolar bone and anatomical structures, making it a preferred choice for measuring buccal bone thickness (5) and alveolar bone width (5) before or after surgical procedures. Moreover, CBCT remains the gold standard for dental and maxillofacial imaging (7,8).

Existing literature suggests that immediate implant placement into extraction sockets may potentially reduce buccal bone resorption and maintain the original alveolar ridge anatomy (10). However, some studies on animals (4,9) do not support this idea, indicating that placing implants in extraction sockets may not prevent remodeling, especially in the case of buccal bone (4,10). Other studies suggest that the extent of resorption on the facial surface of the alveolar bone depends on the buccal bone plate width, with greater facial bone loss occurring with decreasing buccal bone wall thickness (11). To achieve superior aesthetic results, implants should be placed in an ideal three-dimensional position, ensuring adequate thickness of the buccal bone (12,13) and tissue biotype (14). Consequently, a profound comprehension of the anatomy of the anterior maxillary region is crucial.

Furthermore, it is essential to assess the thickness of the bone walls surrounding the socket using precise diagnostic imaging to determine the most suitable treatment approach (15). Surprisingly, there is limited or no documented information regarding the thickness of the facial bone wall in the anterior maxillary region in humans (16).

The primary objective of this study was to evaluate the thickness of the buccal plate covering the maxillary anterior teeth using CBCT images.

Materials and Methods

Patient Selection

This study received approval from the Dicle University School of Dentistry Ethics Committee (Decision No: 2020-23). It retrospectively examined 104 CBCT images obtained from 104 patients aged 20–50 years who sought treatment for various reasons at the Dicle University School of Dentistry between January 2018 and December 2020. The study group consisted of 52 (50%) males and 52 (50%) females, and each patient underwent two CBCT scans within a two-week interval.

Inclusion Criteria

1. Patients in the age range of 20-50 years.
2. Clear CBCT images with high resolution.

Exclusion Criteria

1. Presence of a preexisting dental implant in the target region of the anterior maxilla.
2. History of root canal treatment or the presence of periapical lesions.
3. Ongoing orthodontic treatment.
4. Evidence of vertical or horizontal alveolar bone loss.
5. A distance of more than 4 mm from the cemento-enamel junction (CEJ) to the alveolar bone crest (ABC).
6. Teeth with root anomalies.

Methods

The required images were acquired using a three-dimensional CBCT device (Model 17-19, Imaging Sciences International, Hatfield, PA, USA). During patient positioning, great care was taken to ensure that the beam lines projected by the device were parallel to the sagittal maxillary plane and that the horizontal line passed through the Frankfort plane and remained parallel to the ground. The images were captured in 8-9 seconds at settings of 120 kVp and 5 mA, and the voxel size was set at 0.3 mm.

Measurements on the CBCT images were conducted twice for each patient, at two-week intervals, by the same operator (A.S.) using the i-CAT-vision imaging program. Each measurement on the panoramic screen was performed from the sagittal direction, under maximum magnification, using the i-CAT vision software, with alignment to the mid-facial surface of the tooth.

The measurements included the following:

a) Thickness of the buccal bone measured at the crest level at distances of 1 mm (B-1), 3 mm (B-3), and 5 mm (B-5) apical to the ABC (10, 17, 18) (Fig. 1).

b) The distance from the CEJ to the ABC was measured from the cemento-enamel junction to the apex of the alveolar bone crest (10, 17, 18) (Fig. 2).

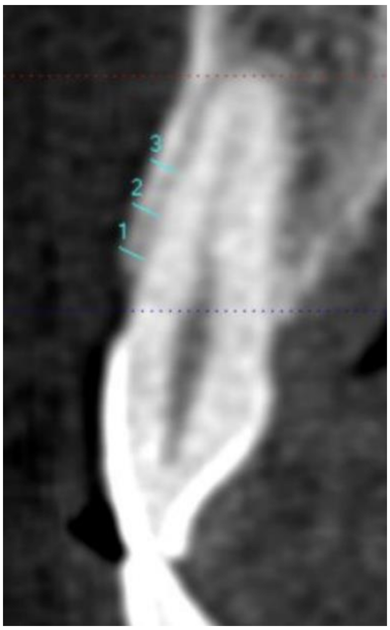

Figure 1. Measurement of the width of the buccal bone at the crest level at distances of 1 mm (B-1), 3 mm (B-3), and 5 mm (B-5) apical to the ABC.

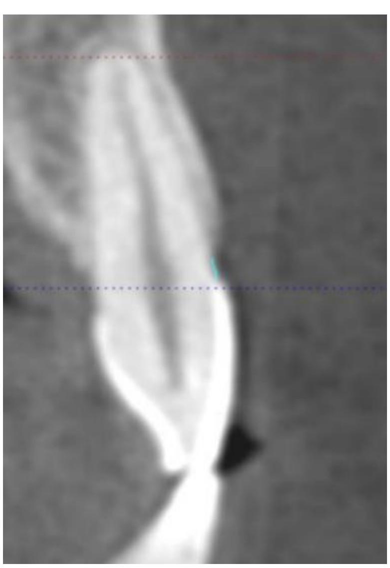

Figure 2. Distance from the CEJ to the ABC.

Statistical analysis

The analysis was conducted using SPSS 21.0 software (IBM Corp., Armonk, NY, USA).

Normal data distribution was analyzed using the Shapiro-Wilk test and/or Kolmogorov-Smirnov test. Variables with abnormal distribution were compared using the Mann-Whitney U test and Kruskal-Wallis H test, followed by a post hoc multiple comparison test. The effect of independent variables on dependent variables was evaluated using linear regression analysis. A p-value of <0.05 was considered significant.

Results

The retrospective study included 104 patients, consisting of 52 male and 52 female patients, aged between 20 and 50 years. The age distribution was as follows: 20-29 years (30.77%), 30-39 years (33.65%), and 40-50 years (35.58%).

The median thickness of the buccal bone was 1.13 mm, 1.22 mm, and 1.04 mm at distances of 1, 3, and 5 mm, respectively, from the alveolar bone crest. The mean distance from the CEJ to the ABC was measured as 2.09 mm (Table 1). Notably, no substantial variation in thickness of the buccal bone was observed between males and females ($p > 0.05$). However, the distance from the CEJ to the ABC was found to be significantly lower in females compared to males ($p < 0.05$; Fig. 3; Table 2).

Table 1. CEJ-ABC distance and buccal bone thickness measurements.

	n	Mean	Median	Min	Max	Sd
CEJ-ABC	624	2.09	2.01	0.85	3.79	0.67
B-1	624	1.13	1.08	0.3	3.06	0.32
B-3	624	1.22	1.24	0	2.77	0.42
B-5	624	1.04	1.08	0	2.83	0.45

The thickness of the buccal bone at 1 mm (B-1) was significantly lower in patients aged 30-39 and 40-50 years than in patients aged 20-29 years ($p < 0.05$). Similarly, the thickness of the buccal bone at 3 mm (B-3) and 5 mm (B-5) showed significant reductions in patients aged 30-39 years than in the younger (20-29 years) and older (40-50 years) age groups ($p < 0.05$ for both comparisons).

Moreover, the distance from the CEJ to the ABC was significantly lower in patients aged 20-29 compared to the 30-39 and 40-50 age groups. Additionally, it was lower in patients aged 30-39 years than in those aged 40-50 years ($p < 0.05$ for both comparisons; Fig. 4; Table 3).

Linear regression analysis indicated that the distance from the CEJ to the ABC had limited explanatory power for the thickness of the buccal bone in central (1.3%) and lateral incisors (1.6%) and canines (4.1%; Table 4). Notably, the linear regression models for the thickness of the buccal bone in central and lateral incisors did not achieve statistical significance ($p > 0.05$). However, they did indicate that the buccal bone's thickness tends to decrease as the distance from the CEJ to the ABC increases in both central and lateral incisors.

In contrast, the model explaining the thickness of the buccal bone in canines did achieve statistical significance ($p < 0.05$), suggesting that the buccal bone's thickness decreases by a factor of 0.201 for each 1-unit increase in the distance from the CEJ to the ABC (Table 2).

Furthermore, the impact of the distance from the CEJ to the ABC on the buccal bone's thickness was found to be statistically significant regardless of the tooth type ($p < 0.05$). In other words, the buccal bone's thickness decreased by a factor of 0.201 for each 1-unit increase in the distance from the CEJ to the ABC (Fig. 3).

Table 2. Comparison of CEJ-ABC distance and buccal bone thickness measurements between genders.

	Genders	Analysis Result								
		n	Mean	Median	Min	Max	Sd	Mean Rank	z	p
CEJ-ABC	Male	312	2.24	2.16	0.85	3.79	0.69	352.55	-5.553	0.001
	Female	312	1.93	1.9	0.85	3.65	0.61	272.45		
	Total	624	2.09	2.01	0.85	3.79	0.67			
B-1	Male	312	1.13	1.08	0.3	3.06	0.32	313.22	-0.101	0.92
	Female	312	1.13	1.08	0.42	2.28	0.31	311.78		
	Total	624	1.13	1.08	0.3	3.06	0.32			
B-3	Male	312	1.21	1.24	0.3	2.58	0.41	311.68	-0.114	0.909
	Female	312	1.22	1.2	0	2.77	0.43	313.32		
	Total	624	1.22	1.24	0	2.77	0.42			
B-5	Male	312	1.07	1.08	0	2.83	0.46	322.09	-1.338	0.181
	Female	312	1.01	1.08	0	2.77	0.44	302.91		
	Total	624	1.04	1.08	0	2.83	0.45			

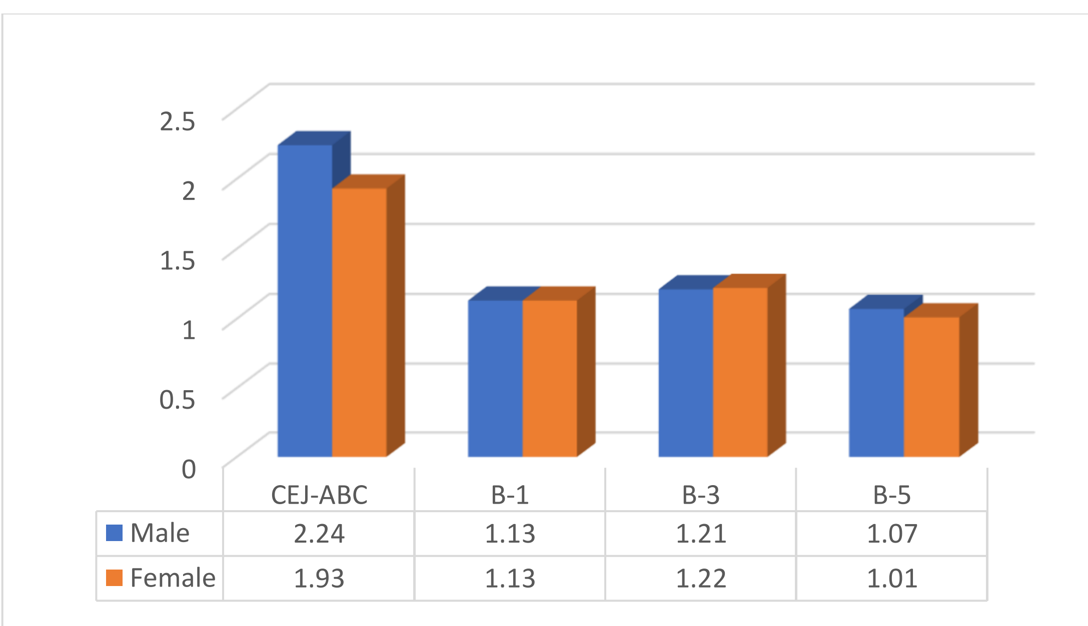

Figure 3. Comparison of CEJ-ABC distance and buccal bone thickness measurements between genders

Table 3. Comparison of CEJ-ABC distance and buccal bone thickness measurements among age groups.

	Age Groups	n	Mean	Median	Min	Max	Sd	Mean Rank	H	p
		Analysis Results								
CEJ	< 30	192	1.75	1.75	0.85	3.35	0.46	221.24	93.353	0.001
	30-40	210	2.05	2.01	0.85	3.71	0.59	311.06		
	>40	222	2.41	2.42	1	3.79	0.74	392.79		
	Total	624	2.09	2.01	0.85	3.79	0.67	1-2 1-3 2-3		
B-1	< 30	192	1.23	1.24	0.42	3.06	0.33	373.25	34.253	0.001
	30-40	210	1.06	1.08	0.3	1.9	0.27	273.27		
	>40	222	1.12	1.08	0.3	2.16	0.33	297.07		
	Total	624	1.13	1.08	0.3	3.06	0.32	2-1 3-1		
B-3	< 30	192	1.29	1.27	0.4	2.42	0.4	345.4	18.425	0.001
	30-40	210	1.12	1.08	0.3	2.42	0.35	271.22		
	>40	222	1.25	1.27	0	2.77	0.47	323.09		
	Total	624	1.22	1.24	0	2.77	0.42	2-1 2-3		
B-5	< 30	192	1.16	1.22	0	2.83	0.48	363.25	41.753	0.001
	30-40	210	0.89	0.85	0	2.12	0.38	250.82		
	>40	222	1.08	1.08	0	2.77	0.45	326.95		
	Total	624	1.04	1.08	0	2.83	0.45	2-1 2-3		

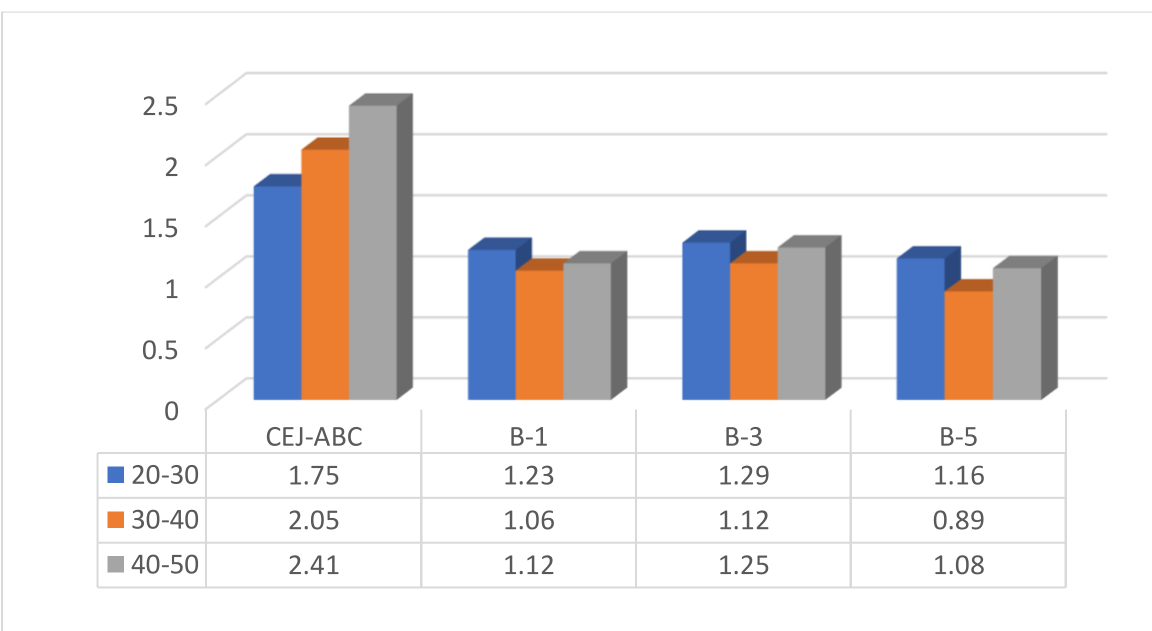

Figure 4. Comparison of CEJ-ABC distance and buccal bone thickness measurements among age groups

Table 4. Comparison of CEJ-ABC distance and buccal bone thickness measurements among tooth groups.

Model Summary				
	R	R Square	Adjusted R Square	Std. Error of the Estimate
Central Incisors	.112a	0.013	0.008	0.30771
Lateral Incisors	.127a	0.016	0.011	0.28585
Canines	.201a	0.041	0.036	0.34154
a Predictors: (Constant), CEJ-ABC distance (mm)				

Discussion

Following tooth extraction, a series of physiological changes occur within the extraction socket during the healing period between tooth removal and implant placement. Many of these changes result from bone resorption and the remodeling of gingival tissues, often leading to esthetic and functional issues (19). To mitigate such problems, the concept of immediate implantation, placing an implant into the tooth socket immediately after extraction, emerged in the 1970s. It has gained popularity due to its ability to reduce treatment time, the number of surgeries required, and bone loss post-extraction (20,21). Some studies have also suggested that placing implants into fresh extraction sockets can prevent bone resorption (22). Additionally, research has shown that the degree of resorption is linked to buccal (facial) bone thickness, with greater bone loss occurring as the thickness of the buccal bone decreases (11). The resorption of facial and palatal socket walls leads to changes in the size of the alveolar bone crest (23). Other studies have indicated that during socket healing, the residual crest apex shifts toward the palatine (back) when viewed axially, and the crest flattens proportionally to the thickness of the bone around adjacent teeth when viewed sagittally (4, 24, 25). The literature suggests that significant bone remodeling occurs, particularly in the first two months after tooth extraction (26). Based on this information, we recognized the importance of alveolar socket wall thickness in regions planned for immediate implantation for long-term success. Consequently, we conducted this study to acquire information about the morphology of the alveolar bone in the anterior maxillary region, where dental aesthetics hold particular importance.

Studies on alveolar bone measurements in the maxillary anterior region have noted differences in the thickness of buccal bone between central and lateral incisors and canine teeth. Hamsah et al. assessed the CBCT images of 186 individuals aged 18-65 years and found that among maxillary anterior teeth, the lateral teeth exhibited the highest mean thickness of the buccal bone, while the canine teeth had the lowest thickness (27). Similar results were reported by Ghassemian et al., Han et al., and Nasrin et al. (28-30). Conversely, Fuentes et al. and Lee et al., who studied smaller patient groups, reported that canines displayed the highest bone thickness among anterior teeth (35,36), whereas Farahamnd et al. reported that maxillary central incisors had the highest bone thickness (31). In our study, we observed that the thickness of the buccal bone was highest for the lateral incisors and lowest for the central incisors. Moreover, the mean bone thickness of the anterior maxillary teeth was 1 mm, a value consistent with what has been reported by Ghassemian et al. (28), Farahamnd et al. (31), Nowzari et al. (32), and Khory et al. (33).

In a 2011 study, Eber et al. (34) examined 125 CBCT images and noted that facial bone thickness was typically below 1 mm in most areas. A similar investigation conducted by Fuentes et al. reported that the median buccal alveolar bone thicknesses of the central and lateral incisors and canine teeth were approximately 1.14 mm, 0.95 mm, and 1.15 ± 0.68 mm, respectively (35). Lee et al. (36) found that the mean buccal bone thicknesses at 3 mm below the alveolar bone crest (ABC) were approximately 0.68 mm, 0.76 mm, and 1.07 mm for the central incisors, lateral incisors, and canines, respectively. Januario et al. (4) found that the thickness of buccal bone ranged from 0.5 mm to 0.7 mm.

In a 2016 study, Khoury et al. (33) evaluated the buccal bone thicknesses in 47 patients at 4 mm, 6 mm, 8 mm, and 10 mm below the cemento-enamel junction (CEJ) and reported that the mean thickness of the buccal bone was approximately 1.0 mm for all teeth at 4 mm below the CEJ. However, there were slight variations, with thickness values of 0.957 mm, 1.077 mm, 1.051 mm, 1.093 mm, 1.146 mm, and 0.94 mm for the right canines, right lateral incisors, right central incisors, left central incisors, left lateral incisors, and left canines, respectively. The thickness measurements decreased gradually in the apical direction at distances of 6 mm, 8 mm, and 10 mm, with lateral incisors, particularly on the right side, demonstrating the highest buccal bone thickness.

Similarly, Lee et al. (36) assessed buccal bone widths at 3 mm and 4.5 mm below the ABC and reported that the mean buccal thicknesses at 3 mm below the ABC were approximately 0.68 mm, 0.76 mm, and 1.07 mm for central incisors, lateral incisors, and canines, respectively. Januario et al. (10) evaluated the buccal bone width at 1 mm, 3 mm, and 5 mm below the ABC and found that the median buccal bone thicknesses at 1 mm were about 0.7 mm for lateral incisors and approximately 0.6 mm for both central incisors and canines.

El Nahass (37) also investigated buccal bone thicknesses at 1 mm, 2 mm, and 4 mm below the ABC for maxillary central incisors and lateral incisors using 73 CBCT images. They discovered that the mean buccal bone thicknesses at a distance of 1 mm were approximately 0.72 mm and 0.73 mm for the central and lateral incisors, respectively. These findings align with the results reported by Ghassemian et al. (28), who assessed 66 patients and found that the buccal bone was thickest for the lateral incisors at all distances from the ABC. In their study, the percentages of teeth with a buccal bone thickness of 2 mm at distances of 1 mm, 2 mm, 3 mm, 4 mm, and 5 mm below the ABC were 0%, 1.5%, 2%, 2.5%, and 3%, respectively. Some studies (17, 28) found that the buccal bone was thinner for maxillary anterior teeth at lower levels than in the upper regions of the ABC, while others (35, 39) reported contrasting results; that is, the bone width was lesser in the upper than in the lower region.

In our study, we discovered that the median thickness of the buccal bone 1 mm below the ABC for the central and lateral incisors and canine teeth was roughly 1.09 mm, 1.16 mm, and 1.14 mm, respectively. At a distance of 1 mm, the buccal bone thicknesses were approximately 1.14 mm, 1.31 mm, and 1.21 mm for the central and lateral incisors and canine teeth, respectively. At 5 mm below the ABC, the measurements were approximately 1.03 mm, 1.06 mm, and 1.04 mm for the central and lateral incisors and canine teeth, respectively. These findings notably exceeded the values reported for all tooth groups in the existing literature.

Some studies (17, 28) have indicated a positive relationship between the distance from the CEJ to ABC and the patient's age. In addition to local factors, such as a history of periodontal disease, gingival recession (40), and non-carious cervical lesions (41), systemic factors, such as age, smoking (42), depression, diabetes, asthma, hypertension, and thyroid diseases (31), have been shown to increase CEJ-ABC distance. However, it is well established that periodontal disease, characterized by the progressive destruction of gingival and bone tissues, initially affects coronal levels (38). Therefore, the distance from the CEJ to the ABC is particularly important in mucogingival surgeries, such as connective tissue augmentation or gingivectomy, and in establishing an ideal biological width for implantation.

AlTarawpeh et al. (43) delved into 180 CBCT images and uncovered that the average distance from the CEJ to the ABC measured 2.15 mm, 2.17 mm, and 2.16 mm for central incisors, lateral incisors, and canines, respectively. These findings align with similar investigations. In their analysis of 200 CBCT images, Zekry et al. (17) reported CEJ-ABC distances of 1.72 mm, 1.97 mm, and 2.0 mm for central and lateral incisors and canine teeth, respectively. Wang et al. (44), working with 300 CBCT images, found CEJ-ABC distances of 1.8 mm, 1.9 mm, and 2.2 mm for central and lateral incisors and canine teeth, respectively. Meanwhile, in a study conducted by Januario et al. (10) in 2010, involving 250 CBCT images, the CEJ-ABC distances were observed to be 1.7 mm, 2.25 mm, and 2.9 mm for central and lateral incisors and canine teeth, respectively. Correspondingly, El Nahass and Naiem reported CEJ-ABC distances of 2.1 mm for central and 2.09 mm for lateral incisors. In our study, we found mean CEJ-ABC distances of 2.01 mm, 2.05 mm, and 2.21 mm for central and lateral incisors and canine teeth, respectively. These values were closely aligned with those reported by AlTarawneh et al. and El Nahass and Naiem. Furthermore, in our investigation, the distance from the CEJ to ABC exhibited correlations with both age and gender.

Specifically, males tended to have a greater distance from the CEJ to ABC compared to females, and older patients displayed a larger CEJ-ABC distance than their younger counterparts. These outcomes are consistent with the findings of Ghassemian et al. (28) but differ from those of Januario et al. (10), who observed no correlations between patient age and gender and either buccal bone width or the CEJ-ABC distance.

Demircan et al. (18) explored buccal bone widths at 1 mm, 2 mm, and 5 mm below the ABC, as well as the CEJ-ABC distance. They discovered that age was positively correlated with the CEJ-ABC distance and buccal bone thickness at 2 mm and 5 mm below the ABC. Additionally, age was significantly negatively correlated with buccal bone thickness, while gender showed no correlation with the CEJ-ABC distance.

In their examination of buccal bone width and the CEJ-ABC distance, AlTarawneh et al. observed that men had significantly higher buccal bone widths at various thirds of the labial and palatal sides of the incisor roots, lateral incisors, and canines compared to women (43). Conversely, Nowzari et al. and Wang et al. found no significant gender-related differences, even though buccal bone thicknesses were slightly higher in men than in women (28, 44).

El Nahass and Naiem identified significant gender-related discrepancies in both buccal bone width at 4 mm below the ABC and the CEJ-ABC distance. In their study, buccal bone thicknesses at 4 mm below the ABC were greater in men, while CEJ-ABC distances were greater in women (37).

We observed that the mean distance from the CEJ to ABC was significantly higher in men compared to women (mean: 2.24 mm for men and 1.93 mm for women; $p < 0.05$). However, no significant gender-based differences were detected in buccal bone thickness ($p > 0.05$). These findings are in line with the existing literature (45-47).

There were noteworthy distinctions among age groups concerning buccal bone thicknesses at 1, 3, and 5 mm below the ABC ($p < 0.05$). At 1 mm, the thickness of the buccal bone was remarkably lower in patients aged 30-39 years (mean: 1.06 mm) and 40-50 years (mean: 1.12 mm) compared to patients aged 20-29 years (mean: 1.23 mm). At 3 mm, the thickness of the buccal bone was remarkably lower in patients aged 30-39 years (mean: 1.12 mm) compared to patients aged 20-29 years (mean: 1.29 mm) and 40-50 years (mean: 1.25 mm). At 5 mm, the thickness of the buccal bone was significantly lower in patients aged 30-39 years (mean: 0.89 mm) compared to patients aged 20-29 years (mean: 1.16 mm) and 40-50 years (mean: 1.08 mm). Consistent with the literature (18, 39, 48), we also observed a negative correlation between age and buccal bone thickness, which decreased as patient age increased.

Buccal bone thickness plays an essential role in shaping the morphological changes of the alveolar bone following tooth extraction (49). Vera et al. have used facial alveolar bone thickness as a criterion to determine when to place implants after tooth extraction, distinguishing between immediate and early placement (50). However, as far as we are aware, no minimum requirement for facial alveolar bone thickness to prevent vertical crest resorption has been defined (16).

In a study from 2019, Rojo-Sanchiz et al. (51) examined 82 patients and categorized them into three groups based on CEJ–ABC distances in the central and lateral incisors and canine teeth. These groups were defined as follows: short (<3 mm), medium (>3 and <4.5 mm), and large (>4.5 mm). They measured the buccal bone widths at 1 mm, 2 mm, and 3 mm below the ABC. Their analysis explored the correlation between the distance from the CEJ to ABC and the thickness of the buccal bone, both among these groups and as a continuous variable. Their findings revealed a negative correlation between the buccal bone thickness and the CEJ–ABC distance in all tooth groups and at all levels (1, 2, and 3 mm below the ABC). Furthermore, they observed that as the distance from the CEJ to the ABC decreased, the likelihood of having buccal bone thicker than 1 mm increased.

We also examined the correlation between buccal bone width and the CEJ-ABC distance at 1, 3, and 5 mm below the ABC across all tooth groups, including the central and lateral incisors and canine teeth. We employed linear regression analysis, and our results confirmed a negative correlation between buccal bone thickness and CEJ–ABC distance in all tooth groups, consistent with the existing literature (1). When we evaluated these tooth groups separately, this correlation was statistically insignificant in the central central (p = 0.09) and lateral incisors (p = 0.1) but statistically significant in canines (p = 0.01).

Conclusion

Our findings reveal that the distance between the CEJ and the ABC was notably lower in women compared to men, and it was positively correlated with age. Gender and buccal bone thickness were not significantly correlated, although age displayed a negative association with buccal bone thickness. Moreover, we observed a consistent negative correlation between buccal bone thickness and CEJ–ABC distance across all tooth groups, with statistical significance emerging primarily with canines.

To gain a deeper insight into the influence of age and gender on the thickness of the buccal bone and the CEJ–ABC distance, further research with more extensive patient groups is essential. Additionally, we recommend the use of preoperative cone beam computed tomography for radiographic analysis to identify risk factors that can inform and refine treatment approaches.

Disclosures

Ethical Approval: Ethics committee approval was received for this study from Dicle University, Faculty of Dentistry, Research Ethics Committee, in accordance with the World Medical Association Declaration of Helsinki, with the approval number: 2020/23.

Peer-review: Externally peer-reviewed.

Author Contributions: Conception – A.S.; Design – A.S., F.İ.; Supervision – F.İ.; Materials – A.S., F.İ.; Data Collection and/or Processing – A.S., F.İ.; Analysis and/or Interpretation – F.İ.; Literature Review – A.S., F.İ.; Writer – A.S., F.İ.; Critical Review – F.İ.

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