

Interdental Area in the Aesthetic Zone of Maxilla – Variations of Distance between Interdental Alveolar Crest and Interdental Contact Point in Relation with Age and Sex

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Abstract: *CBCT- radiographic techniques, can be used to assess the morphological characteristics of the alveolar bone in the aesthetic zone of maxilla. The goal of the present study was to compare the length of distance between the contact point and the most coronal point of the interdental bone in patients of different age groups and different sexes. The study included 406 measurements in CBCT images of 85 patients with nopathological alveolar bone loss and with visibly closed contact areas. Exclusion criteria included: missing upper frontal teeth; teeth crowding; restored maxillary frontal teeth. Statistical analysis was performed using descriptive analysis of the SPSS version 19 software package. The mean (\pm standard deviation) distance from the interdental bone crest to the contact point between maxillary canines and lateral incisors was 3.9 ± 0.9 mm, between lateral and central incisors was 4.2 ± 0.9 mm, and between central incisors was 4.1 ± 1.0 mm. In patients without periodontal diseases, the length of distance between the crest of the interdental bone and the contact point of adjacent maxillary frontal teeth is not in correlation of the age and sex of the investigated individuals.*

Keywords: interdental space, maxilla, CBCT, frontal teeth, aesthetic risk

1. Introduction

The characteristics of the gingival and bone architectonics in the aesthetic zone of the maxilla have a decisive role for the aesthetic result of both periodontal treatment (non-surgical and surgical) and dental implant therapy.

CBCT radiographic technique is necessary for the correct 3D diagnostic of the anatomic characteristics of the alveolar bone, because it presents in details the anatomic features and the resorptive changes in the vestibular, oral and interdental alveolar bone in comparison to the conventional IOPR and OPG. [6]

CBCT has 80-100% precision in the determination of alveolar bone loss, while the conventional intraoral radiographic techniques have approximately 63-67% precision. [5]

In the aesthetic zone, the position of contact points between upper frontal teeth has a decisive meaning for achievement of optimal "pink aesthetic", especially in patients with high smile line. [4]

The main support of the interdental papilla is provided by the underlining interdental alveolar bone. [8]

2. Literature Survey

The height of interdental/interimplant papillae depends to a great extent on the position of the interdental alveolar crest. The optimal conditions to achieve normal interdental/interimplant papilla are obtained when the distance from the contact point to the interdental alveolar crest is 3-4 mm. A distance of 5 mm from the alveolar crest to the contact point is considered periodontally healthy. In

periodontal disease, due to the loss of bone the distance between the contact point and the interdental alveolar crest increases, resulting in an open gingival embrasure. [1]

The results of one study of Tarnow et al., demonstrate that in 98% of cases when the distance from the contact point to the most coronal part of interdental alveolar crest is below 5 mm, the interdental papilla are periodontally healthy and fill entirely the interdental spaces. A distance of more than 5 mm results in an open embrasure ("black triangle"). Furthermore, when the distance is more than 7 mm, papilla is missing in most of the cases or fills the embrasure only in 27%. At 6 mm, papilla is present in half of the cases or fills the embrasure in 56%. Therefore Tarnow et al. concluded that the distance from the contact point to the crest of interdental bone has a decisive role for the presence of intact interdental papilla between two adjacent teeth. [8]

Another study shows that the increase of the length of this distance by 1 mm increases the risk of appearance of open embrasure by between 78% and 97%. [2]

In another study, Tarnow et al. assessed 288 interproximal spaces in 30 patients. On the basis of the results they concluded that the distance from the contact point to the crest of interdental bone primarily varies between 3,4 and 5 mm. [3]

3. Material and Methods

This study included the CBCT images of 85 patients – 36 males and 49 females (age range: 18–68 years, mean age: 38 years).

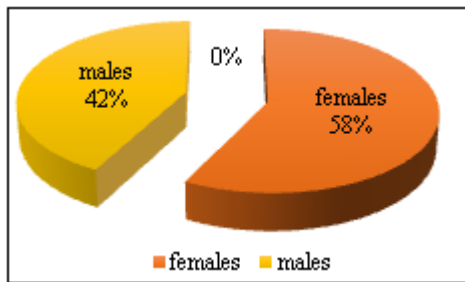


Figure 1: Sex distribution of examined patients

The age distribution is as follows: 13 CBCT images of patients under 25 years, 55 images of patients between 26 and 45 years old and 17 images of patients over 45 years. The aim of this distribution is to determine the variations in the distance from the contact point to the most coronal part of the crest of the interdental bone in different age groups.

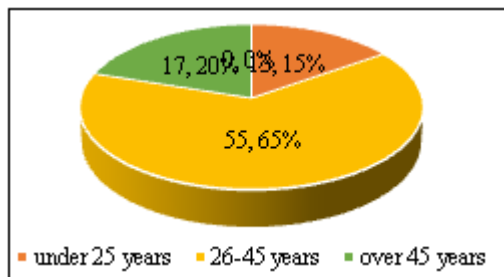


Figure 2: Age distribution of examined patients

The study includes 406 measurements – 166 measurements between central and lateral incisors; 162 measurements between maxillary canines and lateral incisors and 85 measurements between central incisors.

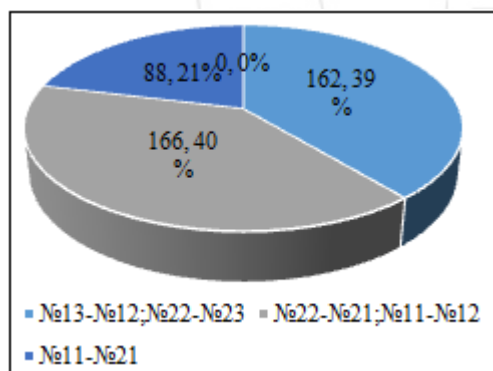


Figure 3: Distribution of the measurements between the different teeth groups

All measurements are made from the contact point between two adjacent teeth to the most coronal point of the interdental bone crest point in the aesthetic zone of the maxilla. The measurements are done through the center of the axial plane.

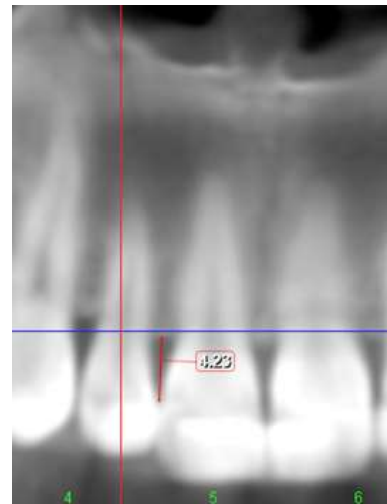


Figure 4: CBCT-assessment of the distance between central and lateral incisor

In the test group are included only the CBCT images of patients who respond to the following criteria:

- All participants in the study are over 18 years old
- All participants in the study have permanent dentition in the frontal sextant of the maxilla
- No missing or decayed teeth in the aesthetic zone of the maxilla
- No prosthetically restored upper frontal teeth with crowns or veneers
- No pathological interdental alveolar bone loss in the upper frontal sextant
- Visibly closed contact areas

The CBCT images of potential subjects who meet any of the following criteria are excluded from participating in the study:

- Missing upper frontal teeth;
- Teeth crowding;
- Prosthetically restored maxillary frontal teeth
- Patients with brackets
- With alveolar bone loss in the aesthetic zone of maxilla
- With no visibly closed contact areas

The assessed CBCT radiographic images are taken from the data base of the Varna Medical University Centre.

Statistical descriptive analysis was performed using the SPSS version 19 software package.

4. Results

The results from our study of 88 values indicate that in the aesthetic zone of the maxilla between the central incisors the mean value of the distance from the contact point to the interdental alveolar bone crest is 4,13 mm and varies from 2,24 to 6,9 mm, and in most cases it primarily varies between 4-4,5 mm.

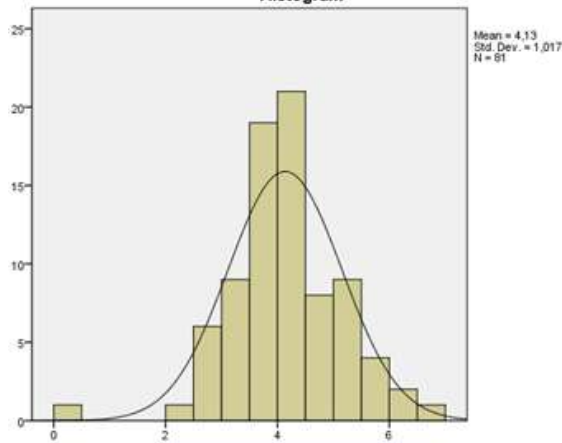


Figure 5: Assessment of the distance from the contact point to the interdental alveolar bone crest between the central incisors

The results imply that in the aesthetic zone of maxilla between the central and lateral incisors the mean distance from the contact point to the interdental alveolar bone crest is 4,16 mm and varies from 2,97 to 7,26 mm, and in most of the cases is approximately 4-4,5 mm.

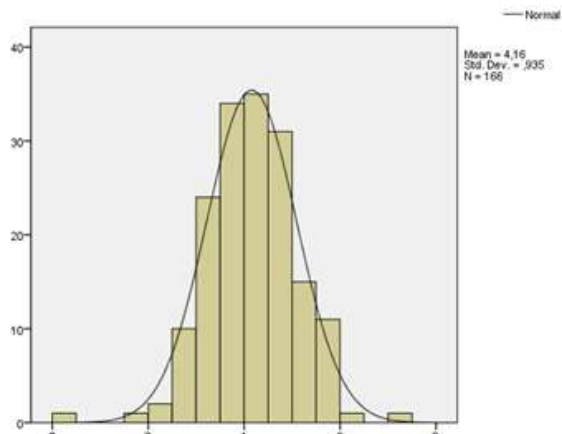


Figure 6: Assessment of the distance from the contact point to the interdental alveolar bone crest between central and lateral incisors

Between the lateral incisors and maxillary canines, the mean value of this distance is 3,92 mm and varies from 2,24 to 6,60 mm, and in most of the cases it is approximately 3,5-4 mm (fig.7).

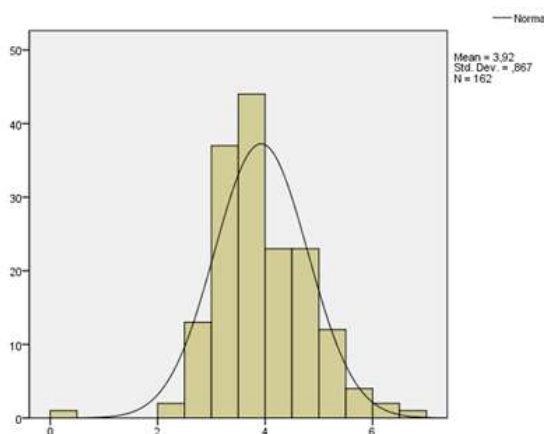


Figure 7: Assessment of the distance from the contact point to the interdental alveolar bone crest between maxillary canines and lateral incisors

Table 1: Mean values of the distance from the contact point to the interdental alveolar crest in the aesthetic zone of the maxilla

	central incisors (n=88)	central & lateral incisors (n=166)	Lateral incisors & canines (n=162)
Mean value	4,13	4,16	3,92
Minimum	2,24	2,97	2,24
Maximum	6,90	7,26	6,60

The mean value of the distance from the contact point to the interdental alveolar crest in the aesthetic zone of the maxilla is lowest between the maxillary canines and lateral incisors.

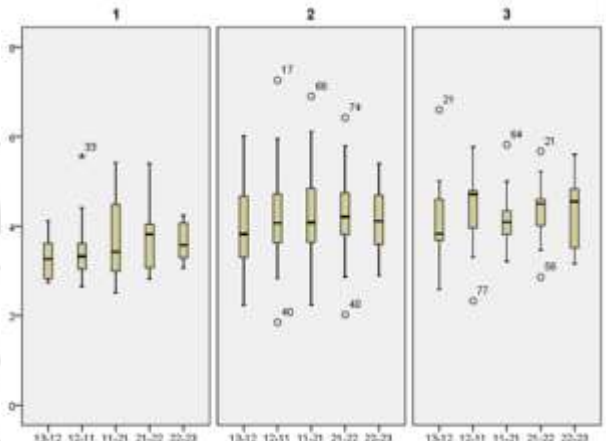


Figure 8: Variations of the length of distance from the contact point to the interdental alveolar crest in the aesthetic zone of the maxilla in patients of different age groups (1-under 25 years, 2-between 26-45 years, 3-over 45 years)

Figure 8 shows that in the aesthetic zone of the maxilla the distance from the contact point to the interdental alveolar ridge in patients with no periodontal diseases increases insignificantly with the increase in age. According to the sex of the patients, the following results are received:

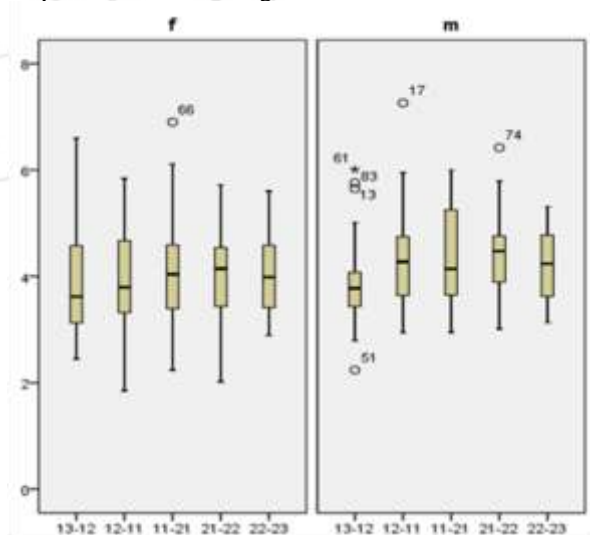


Figure 9: Variations in the distance from the contact point to the interdental alveolar bone crest in the aesthetic zone of the maxilla in both sexes

Figure 9 shows that in the aesthetic zone of the maxilla in patients with no periodontal diseases the distance from the

contact point to the interdental alveolar bone crest has insignificantly higher mean value in men in comparison to women.

5. Discussion

Preoperative CBCT planning has decisive meaning in the diagnostic and the assessment of the length of the distance between the contact point to the interdental alveolar bone crest and facilitates the predictability and prognosis of the aesthetic risk in immediate implant dental therapy in the aesthetic zone of the maxilla. (7)

The optimal conditions to achieve normal interdental/interimplant papilla are when the distance from the contact point to the interdental alveolar crest is 3-4 mm. A distance of 5 mm from the alveolar crest to the contact point is considered periodontally healthy. (1)

Figures 5,6 and 7 show that the mean value of the length of distance from the contact point to the interdental alveolar bone crest between central incisors, is primarily about 4-4,5 mm, between lateral and central incisors –4-4,5 mm and between lateral incisors and maxillary canines – approximately 3,5-4 mm.

The results of our study confirmed the results of Tarnow's et al study, that the distance from the contact point to the crest of interdental bone primarily varies between 3,4 and 5 mm. [3]

The analysis of the received results in table 1 confirms that in respect to the distance between the contact point and the interdental bone crest, the best conditions for achieving interdental/interimplant papilla are obtained in the cases of immediate implant treatment in the area of maxillary canines and maxillary lateral incisors, which also has lower aesthetic risk.

In the aesthetic zone of the maxilla, in patients with no periodontal diseases and no pathological bone loss, the distance from the contact point to the interdental alveolar ridge increases insignificantly with the increase of the age of the patient. Therefore according to this criteria there will be a lower aesthetic risk for immediate implant therapy in frontal sextant of maxilla in younger patients than in older ones (fig.8).

In the aesthetic zone of the maxilla in patients with no periodontal diseases and no pathological bone loss, the distance from the contact point to the interdental alveolar ridge, measured on CBCT images has insignificantly higher value in men than in women. Therefore according to this criterion there will be a lower aesthetic risk for immediate implant therapy in the frontal sextant of maxilla in females than in males (fig.9).

6. Conclusion

In the aesthetic zone of the maxilla in patients with no periodontal diseases, the mean values of the distance from the contact point to the interdental alveolar ridge between the adjacent upper frontal teeth on CBCT images, vary

between 3,5 and 4,5 mm and have lower mean values between maxillary canines and lateral incisors in females and in younger patients.

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