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Radiographical vertical and horizontal distances influencing the presence of interproximal papilla between maxillary central incisors

Dr. Suzan Ali Salman BDS, M.Sc.

Abstract

Conventional tooth the presence of interdental papillae in the maxillary anterior region plays a key esthetic role. The presence or absence of the interproximal papilla is of great concern to periodontists, orthodontists, restorative dentists and to patients

The aim of the study was to determine the association between different distances and central papilla recession

The central papilla was visually assessed in 50 adults students of age ranged between (19-25 years) in dental clinic, then by using standardized periapical radiographs for the maxillary central incisors, the following vertical distances were measured: papilla tip to contact point (PT-CP), bone crest to contact point (BC-CP), proximal cementoenamel junction to contact point (pCEJ-CP), bone crest to papilla tip BC-PT(the papilla height (PH)).Interdental width (IDW) was measured horizontally. Subjects were divided into 2 groups according to interdental width (IDW) and pCEJ-CP distance respectively: 1. (28) subjects with IDW≤2mm and pCEJ–CP >4 mm as narrow-long group 2. (22) Subjects with IDW≤2mm and pCEJ–CP ≤ 4 mm as narrow-short group.

Narrow-long group exhibited more papilla recession, (PT-CP) mean was 2.5mm and the difference was statistically significant. Positive correlations were found between (BC-CP), (pCEJ-CP), (IDW) and central papilla recession and more stronger correlations were found with (BC-CP) (r = 0.856). Papilla height was negatively correlated with (BC-CP), (pCEJ-CP), (IDW) and stronger correlation was found between papilla height and (BC-CP) (r = -0.502)

Central papilla recession is associated with narrow interdental width and long pCEJ-CP distance, papilla presence influenced by different distances, some of them are (BC-CP), (pCEJ-CP), (IDW) distances, (BC-CP) had stronger effect on the presence of central papilla.

Key word: Central papilla, factors, papilla recession

Introduction

It is always helpful to start any endeavor in dentistry with an image of what normal or ideal would be. In addition, it is helpful to know what may be acceptable while not ideal, and also to know what would be undesirable. In dentistry, increased aesthetic demands require a soft-tissue contour with an intact papilla and a symmetric gingival outline.(1) The presence of a papilla between the maxillary central incisors is a key aesthetic factor in any individual (3,2) The inter-dental gingiva of the incisor

region usually assumes the shape of a pyramidal papilla, or it may appear as a slight gingival col, depending on the location of the contact area and on the height of the gingiva [4, 5] The existence of a space below the contact area can lead to aesthetic impairment, phonic problems, and food impaction [6, 7]. With regards to the interdental embrasure and the papillae that occupy it, a study of well-aligned, unworn natural teeth found that, when comparing the length of the contact area and the height of the papilla, approximately a 50/50 relationship existed.[8] That is, 50% of the overall tooth length was contact and the remaining 50% was papilla. Papilla always present when the distance between the contact point (CP) and bone crest (BC) is 5mm or less, but that papilla are typically absent when the CP–BC distance is 7mm or more [6]. The open gingival embrasure, also called the "black triangle," is a visible triangular space caused by the lack of interdental gingival papilla filling this area.

The central incisors are the most dominant anterior teeth in the maxillary arch because they can be fully visible in patients with a broad smile [8, 9]. Several reasons contribute to loss of interdental papilla and establishment a black triangle between teeth. In addition to the BC-CP distance, other, less well understood, factors also help determine whether the inter-dental papilla will be present; these include angulation of the roots of adjacent teeth, crown shape, space between adjacent teeth, volume of the embrasure space, and the course of the cementoenamel junction. Traumatic oral hygiene procedures may also negatively influence the outline of the interdental soft tissues. [6,7,8,10,11,12] .The aim of the study was to determine the association between (BC-CP), (pCEJ-CP), (IDW) distances and central papilla recession

Materials and Method

Between December 2010 and April 2010, 50 adults students of age ranged between (19-25 years) with fully erupted permanent dentition, selected from the College of Dentistry, University of Baghdad. Inclusion criteria were healthy gingiva with a plaque-and-gingival index of 0–1 [13, 22] and with well-aligned maxillary central incisors (i.e., no spacing, no crowding, and no intrusion/extrusion). Exclusion criteria were systemic compromise that included pregnancy or a history of taking medications known to increase the risk of gingival hyperplasia, presence of an artificial crown on the central incisors, proximal/ cervical restorations or abrasions, a history of surgery in the anterior maxillary area, or open contact or crowding. Visual examinations were performed to detect inter-dental papilla between maxillary central incisors (defined as central papilla). If no space was visible apical to the contact area, the papilla was recorded as being present without central papilla recession. If a space was visible apical to the contact area, which was gently filled with a temporary soft, radiopaque restorative material (Caviton, GC Corporation, India), it was recorded as central papilla recession. Periapical radiographs of maxillary central incisors of all subjects were obtained using a paralleling technique with an Egen film holder [14].To verify the radiographic magnification, band and retainer were bonded to the right central incisor of 5 subjects as an indicator of the magnification. The average magnification of the method was 0.9mm. all measurements made on the radiographs were carried out using an electric magnifying x- ray viewer (realist x-ray viewer model No. 3356) and a transparent plastic measuring grid , this grid were occluded on the

periapical x-ray under the magnifying lens of the x-ray viewer then we measured the distances in mm.

Vertical distances measured on radiographs included

1. (PT–CP): represented the distance from the papilla tip to contact point More specifically, the distance was the length of a vertical line from the apical margin of the space filled with the temporary hydraulic restorative agent to the apical point of the contact area (the distance is the central papilla recession).
2. (pCEJ–CP) represented the distance from the proximal cementoenamel junction to contact point, the length of a vertical line from the proximal CEJ line of two central incisors to the apical point of the contact area. Location of pCEJ and CP were shown in figure (1)
3. (BC–CP): the length of a vertical line from the Bone crest to the apical point of the contact area Location of BC and CP were shown in figure (1)
4. (BC–PT): the length of a vertical line from the crest of the bone to the papilla tip (the distance is the papilla height)

Horizontal measurements included IDW; the width between the two central incisors at the proximal CEJ level (interdental width) as shown in figure (2)

All subjects were divided into two groups according to their IDW and (pCEJ–CP) measurements, respectively:

1. (28) subjects with IDW≤2mm and pCEJ–CP >4 mm as narrow-long group.
2. (22) subjects with IDW≤2mm and pCEJ–CP ≤ 4 mm as narrow-short group.

Statistical analyses

Commercially available statistical software (SPSS version 15) was used to analyze the data, which is presented as the mean, standard deviation. Student t – test was used to compare differences between the means of the two groups. Correlation coefficient (r) was used to measure associations of two variables

Results

The morphologic differences of the two groups that were established according to Interdental width (IDW) and pCEJ- CP distances measurements are shown in Table (1) Significant differences were apparent between the two groups in the criteria that included central papilla recession (P- value was 0.002), BC-CP (P-value was 0.003) and highly significant differences regarding pCEJ-CP (P-value< 0.01) vertical distances. Table(2) present the data concerning the correlation between the central papilla height and BC-CP, IDW and pCEJ-CP distances, papilla height was negatively related to BC-CP(correlation coefficient (r) was -0.502), IDW(correlation coefficient (r) was -0.285) and pCEJ-CP distances (correlation coefficient (r) was -0.357). While these distances were positively and strongly related to papilla recession, much stronger correlation was found between papilla recession and BC-CP (correlation coefficient (r) was 0.856) as shown in table (3). Figure (3) shown mean of BC-CP, pCEJ-CP, PH and IDW of the two study groups

Discussion

Radiographic method is non invasive, simple, accurate, and easily accepted by subjects. And, the use of radiopaque material and periapical radiographs may permit measurement of the length of the inter-dental papilla

in relation to the crestal bone, which would enable more accurate prognoses for a regenerated papilla [15]. The recession of the interdental papilla, especially in the area of the central maxillary incisors, is of great concern to dentists and patients. The sensitivity of the papilla recession of the anterior teeth is higher because of its longer and thinner shape. Many factors account for the presence of the interdental papilla; the distance from bone crest to contact point is the most commonly studied of these, but there are many others [10,12,16]. There is an important need in aesthetic dentistry to find the risk factors for recession of the central papilla including the association between embrasure morphology and the central papilla recession. In an attempt to further understand the influences on central papilla recession, here in embrasure morphology of the study subjects were divided into two groups according to interdental width and pCEJ–CP distance, respectively: narrow- long, narrow-short. Presently, more papilla recession occurs in long narrow group than short narrow, it has been suggested the variation in morphology of the human periodontium may be related to the shape and form of the teeth. This observation tends to confirm the hypothesis that subjects with long and narrow teeth have a comparatively thin periodontium and may be more susceptible to gingival recession than subjects who belong to a "biotype" with large maxillary central incisors and a thick periodontium.[17] this in agreement with Chang study[18] The height of the papilla is determined by three things: the level of the interproximal bone, the patient's biologic width, and the size and shape of the gingival embrasure of the teeth [19] If you think of the floor of a room as the bone, and the legs on a desk as the biologic width, imagine placing a water balloon on the desk between your hands. This effectively is the tissue that sits coronal to the patient's biologic attachment. If you now move your hands farther apart, the water balloon will sag and become shorter in height relative to the desktop. If, on the other hand, you squeeze your hands together, the balloon will move higher above the desktop. This is the same impact that altering embrasure form has on papilla height. The more open the embrasure, the flatter and more apical the papilla will be. Table (2) presents the data concerning the correlation between papilla height and the variables. The variables were negatively related to central papilla height and the relationship was much stronger between BC-CP distance and papilla height. Table(3) shown the correlation between papilla recession (PR) and the same variables or distances ,positive correlation were found between papilla recession (PR) and variables and much stronger relation was found between papilla recession and BC-CP distance. These results were in agreement with Chen et al [1], Tarnow et al [6], Yu-Jen et. al.[14] ,Chang L.C.[20] and Ferreira et al [21] studies.

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Table (1) Characteristics of the two study groups

Subjects number	Narrow- long		Narrow- short		t- test	P-value
	28		22			*P<0.05 S **P>0.05 NS
PR(-)/PR(+)	10/18		17/5			
Variables	Mean	SD	Mean	SD		
pCEJ-CP	5.625	0.661	4.205	0.667	7.51	P<0.01 HS
IDW	1.710	0.377	1.655	0.307	0.58	0.56 NS**
PT-CP(PR)	2.5	1.26	1.8	1.02	4.02	0.012 S*
BC-CP	6.348	0.698	5.409	0.84	4.22	0.013 S*
BC-PT(PH)	4.392	1.057	4.75	0.783	1.37	0.18 N S**

PR (-) without central papilla recession; PR (+) with central papilla recession

Table (2) Correlation coefficient (r) between BC-PT (PH) and variables

	PH	
	r	P-value
BC-CP	-0.502	P<0.01 HS
pCEJ-CP	-0.357	P<0.01 HS
IDW	-0.285	0.013 S

Table (3) Correlation coefficient (r) between PT-CP (PR) and variables

	PR	
	r	P-value
BC- CP	0.856	P<0.01 HS
pCEJ-CP	0.645	P<0.01 HS
IDW	0.423	0.012 S

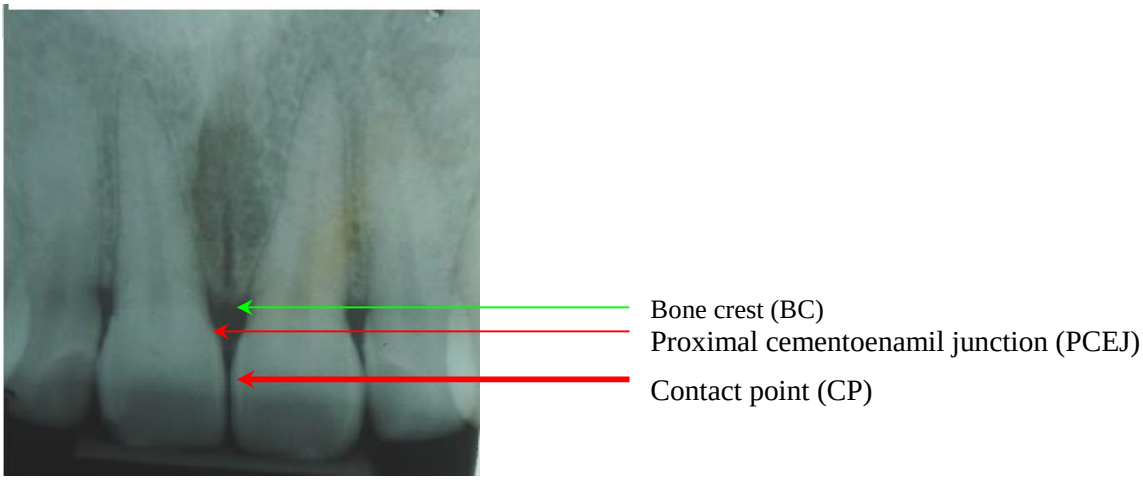

Figure (1) periapical radiographs of maxillary central incisors. The horizontal lines indicate the following locations, from top to bottom: Bone crest (BC), Proximal cementoenamil junction (PCEJ)and Contact point (CP)

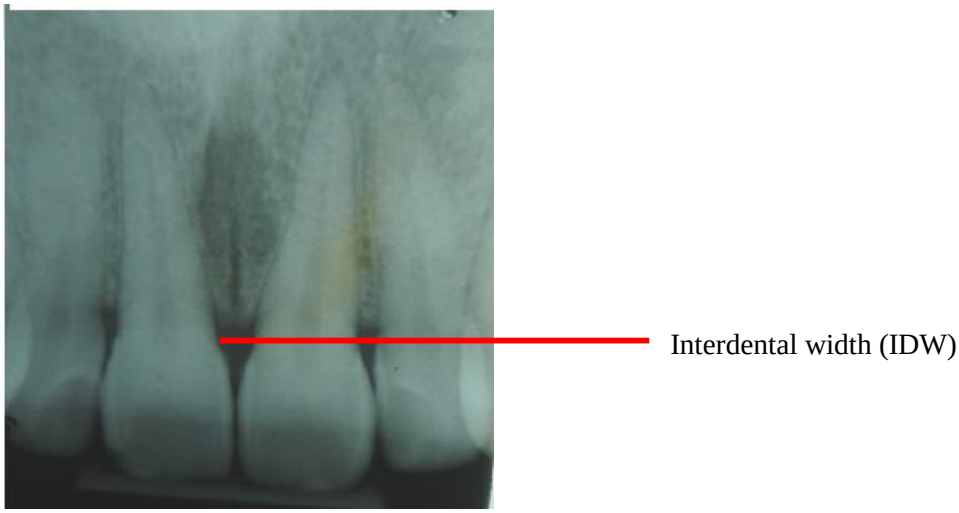

Figure (2) shown the horizontal distance measured from periapical x-ray: Interdental width (IDW)

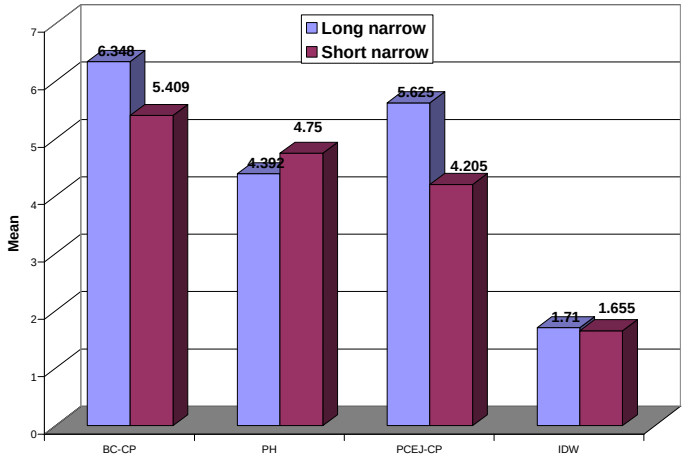

Figure (3) shown mean of BC-CP; PH; pCEJ-CP; IDW of the two study groups