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KEY GINGIVAL DIMENSIONS AND SHAPES OF MAXILLARY CENTRAL INCISORS IN A MIDDLE EAST POPULATION – A PRELIMINARY REPORT

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ABSTRACT

BACKGROUND: The purpose of this study was to evaluate whether a correlation exists between maxillary central incisor tooth shapes and various periodontal parameters, including gingival and periodontal characteristics.

MATERIALS AND METHODS: Clinical measurements were recorded for 60 systemically healthy male and female individuals aged 21–35 years. Measurements included crown width (CW), crown length (CL), height of the interproximal papilla (Ph), gingival angle (GA), mesiodistal width (MDW), and contact surface length (CS) of the maxillary central incisors. Based on the crown shape, participants were categorized into three groups: tapered, square, or ovoid. These groups were analyzed for statistically significant differences in the recorded clinical parameters.

RESULTS: Statistically significant differences were observed among the three tooth shape groups in papillary height, gingival angle, and contact surface length ($P < 0.05$).

CONCLUSION: Tooth shape is significantly associated with variations in gingival angle, contact surface length, and interproximal papilla height. These correlations may serve as useful clinical guidelines in esthetic planning for restorative and prosthodontic treatments involving the maxillary central incisors.

INTRODUCTION

The morphology of teeth and surrounding periodontal structures is intrinsically interconnected. Gingival architecture is commonly categorized into two primary biotypes: thick-flat and thin-scalloped. The thin-scalloped gingival biotype is typically associated with a narrow cervical tooth contour, smaller contact areas, and interproximal contact points located near the incisal edge. These individuals also tend to present with longer interproximal papillae. In contrast, individuals with a thick-flat gingival biotype exhibit broader cervical contours, wider contact areas positioned closer to the gingival margin, and shorter interproximal papillae [1,2].

Tooth and gingival morphology are influenced by various factors, including race, geographic region, gender, and dietary habits[3]. Understanding the average tooth and gingival shapes within specific populations is critical for accurate prosthodontic planning. Prior studies have demonstrated that these morphological characteristics vary significantly between and within racial groups [4-6].

A comprehensive knowledge of dental and gingival anatomy serves as the foundation for successful prosthetic rehabilitation. Restorative interventions must achieve biological compatibility and aesthetic integration with the adjacent soft tissues. Smile aesthetics are determined by a combination of factors, including tooth shape, size, color, alignment, and symmetry, as well as gingival contour, regularity, and papillary form[1,2,6]. The maxillary anterior teeth are particularly important in defining facial aesthetics, as they provide structural support to the upper lip and contribute to overall facial harmony. Additionally, they are involved in essential functions such as food incision, speech articulation, and mandibular guidance during eccentric movements[7].

Therefore, a thorough understanding of anterior tooth and gingival morphology is essential for achieving restorative outcomes that are both aesthetically pleasing and functionally effective. The key objectives of restorative dentistry include the

recreation of clinical crown morphology, aesthetic rehabilitation, and the preservation or enhancement of periodontal and temporomandibular joint health.

In contemporary implant dentistry, the morphology of the maxillary anterior teeth—particularly the central incisors—plays a pivotal role in achieving optimal aesthetic outcomes. When planning implant-supported prostheses in the aesthetic zone, the shape of the tooth becomes a critical factor. To evaluate and understand the relationship between maxillary central incisor crown morphology and the periodontal phenotype, it is essential to establish a standardized and universally understood classification system.

Such a classification facilitates effective communication among clinicians, including surgeons, restorative dentists, dental technicians, and patients. The present clinical study aimed to define and quantify the morphological characteristics of the maxillary central incisors. By establishing specific measurement parameters, the crowns were categorized into three distinct forms: **triangular**, **square**, and **ovoid**.

This classification framework is intended to support more precise clinical decision-making in aesthetic prosthodontics, with particular attention to the periodontal context and its influence on restorative outcomes.

MATERIALS AND METHODS

Following ethical clearance from the Institutional Review Board (IRRB-02-22122024), a total of 60 Middle Eastern dental patients (both male and female), aged between 21 and 35 years, were recruited from the outpatient department of the ISNC Dental Clinic, Jeddah, Saudi Arabia. All participants were thoroughly informed about the nature and purpose of the study, and written informed consent was obtained prior to any clinical procedures.

Inclusion criteria required participants to be in good general health, have completed skeletal growth, and possess both permanent maxillary central incisors. The following exclusion criteria were applied during subject recruitment: presence of destructive periodontal disease; current pregnancy or lactation; use of medications known to influence gingival thickness (e.g., cyclosporine A, calcium channel blockers, or phenytoin); extensive restorations or prosthetic replacements of the maxillary central incisors; carious lesions on the interproximal surfaces or at the cementoenamel junction; history of dental trauma altering the natural shape of the incisors; previous orthodontic treatment; evident craniofacial asymmetry; history of periodontal surgical procedures involving the anterior maxillary region; and the presence of incisal wear (abrasion, attrition, or erosion) extending to the dentin, or evidence of incomplete passive eruption.

For each participant, demographic data including age and gender were recorded. Standardized intraoral photographs were obtained using a cheek retractor and mouth prop to ensure consistent visualization. A millimeter-calibrated ruler was placed directly below the incisal edges of the maxillary central incisors to facilitate accurate measurement and morphological assessment.

Measurements

An image analysis software (ImageJ, National Institutes of Health, USA) was employed to perform quantitative assessments of tooth morphology. The built-in calibration tool within ImageJ was utilized to convert pixel values to millimeters, ensuring measurement accuracy.(Images 1-3). Measurements were independently conducted by three different examiners, calibrated accordingly, and standardized values were assigned for each parameter assessed.

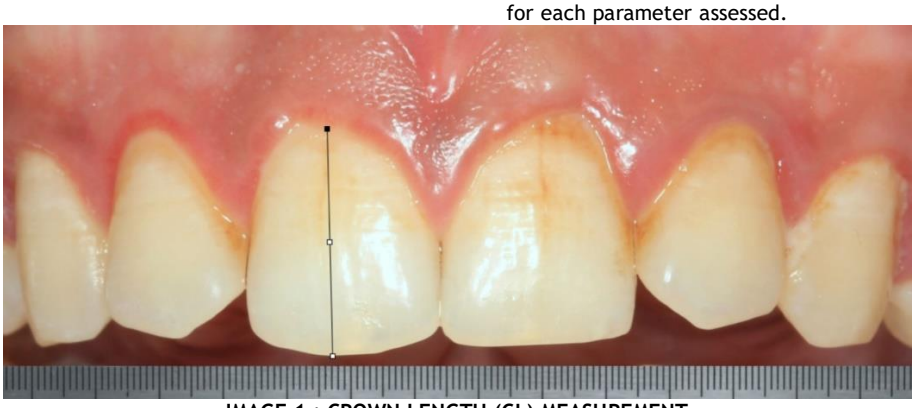

IMAGE 1 : CROWN LENGTH (CL) MEASUREMENT

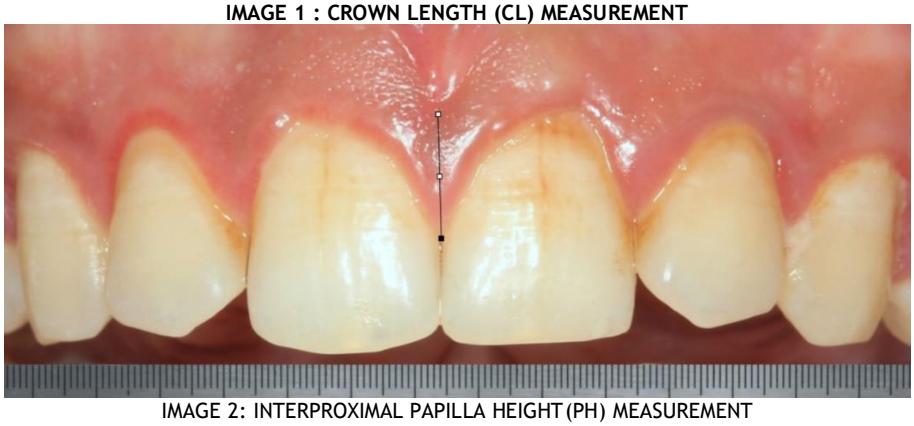

IMAGE 2: INTERPROXIMAL PAPILLA HEIGHT (PH) MEASUREMENT

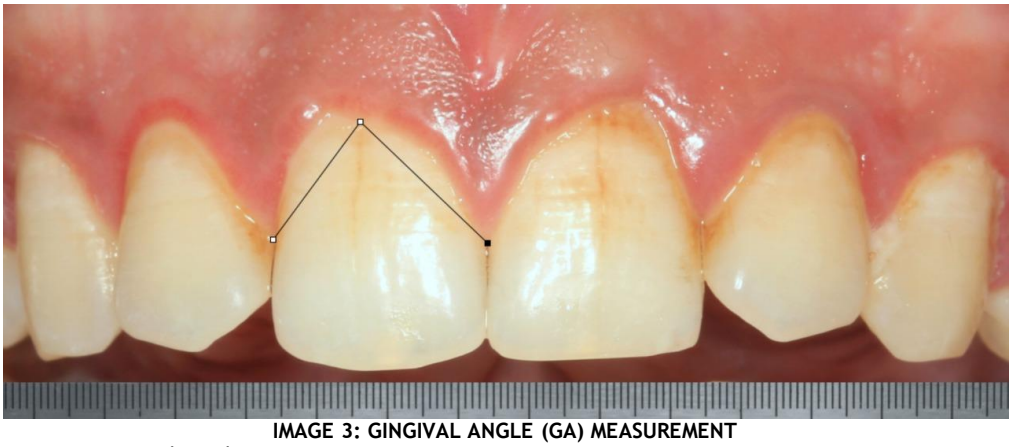

IMAGE 3: GINGIVAL ANGLE (GA) MEASUREMENT

The following parameters were evaluated:

- **Crown Width (CW):**
  The mesiodistal width of the crown was measured at the junction between the middle and cervical thirds of the crown length. This point was determined by dividing the crown into three equal parts: incisal, middle, and cervical thirds.
- **Crown Length (CL):**
  Defined as the longest apicocoronal dimension of the crown, measured parallel to the tooth's long axis—from the incisal edge to the gingival zenith.
- **Crown Width-to-Length Ratio (CW/CL):**
  Calculated by dividing CW by CL. This ratio reflects the relative narrowness of the apical third of the clinical crown.
- **Mesiodistal Width (MDW)**
  The greatest horizontal distance between the mesial and distal interproximal contact points on the labial aspect of the tooth.
- **Interdental Papilla Height (PH):**
  The vertical distance (parallel to the long axis of the tooth) from the highest point of the interdental papilla to a reference line connecting the gingival zeniths of the adjacent teeth on the distal side.
- **Gingival Angle (GA):**
  The angle formed at the marginal gingiva, calculated by intersecting two lines: one extending from the most apical point of the facial gingival margin along the tooth's long axis, and the other connecting the most apical points of the mesial and distal interproximal contact areas.
- **Contact Surface Length (CS):**
  Measured along the mesial surfaces of the maxillary central incisors, from the most apical extent of the contact area to its most incisal point.

RESULTS:

TABLE 1: CLUSTER ANALYSIS OF FREQUENCY TO DETERMINE CENTRAL INCISOR SHAPES

CL/CW	FREQUENCY	SHAPE
0.67 - 0.77	19	TAPER
0.78 - 0.89	39	OVOID
0.90 - 1.07	62	SQUARE
	120	

Data Analysis and Tooth Shape Classification

After calculating the crown width-to-length (CW/CL) ratios, the **k-means clustering algorithm**—an unsupervised machine learning technique used for cluster analysis—was applied to categorize the data. Prior to clustering, a validity test was performed to determine the optimal number of clusters (**k**), which was set to three.

Based on the CW/CL ratios of the 120 maxillary central incisors analyzed in this sample of young Middle Eastern Asian adults, three distinct morphological groups were identified:

- **Tapered Shape:** CW/CL ratio between **0.67 and 0.77** (n = 19)
- **Ovoid Shape:** CW/CL ratio between **0.78 and 0.89** (n = 39)
- **Square Shape:** CW/CL ratio between **0.90 and 1.07** (n = 62)

This classification reflects variation in crown morphology within the studied population and provides a standardized framework for morphological assessment relevant to aesthetic dental planning.

TABLE 2: DESCRIPTIVE FEATURES OF THE GIVEN VARIABLES

		CROWN WIDTH(CW)	CROWN LENGTH(CL)	CW/CL ratio	MESIO-DISTAL WIDTH (MDW)	INTERDENTAL PAPILLA HEIGHT(PH)	GINGIVAL ANGLE(GA)	CONTACT SURFACE(CS)	MDW/CL
N	Valid	120	120	120	120	120	120	120	120
	Missing	0	0	0	0	0	0	0	0
Mean		3.7108	4.2633	0.878	4.215	1.4575	88.9258	1.3625	1.0491
Std. Error of Mean		0.06695	0.08335	0.00866	0.28379	0.04742	0.84775	0.05431	0.09771
Median		3.6	4	0.9	3.6	1.3	90.4	1.35	0.907
Mode		3.6	4	1	3.6	1.3	97	1.9	1
Std. Deviation		0.73336	0.91302	0.09491	3.10872	0.51948	9.28661	0.59495	1.07041
Variance		0.538	0.834	0.009	9.664	0.27	86.241	0.354	1.146
Minimum		2.4	3	0.67	2.4	0.3	65	0.2	0.5
Maximum		6.1	6.9	1.07	23	2.9	109	3	7.67

Descriptive Statistics

A total of 120 maxillary central incisors were analyzed. The mean values and standard deviations of the measured parameters were as follows:

- **Crown Width (CW):** 3.71 ± 0.73 mm
- **Crown Length (CL):** 4.26 ± 0.91 mm
- **Crown Width-to-Length Ratio (CW/CL):** 0.878 ± 0.09mm
- **Mesiodistal Width (MDW):** 4.22 ± 3.10 mm
- **Interdental Papilla Height (PH):** 1.46 ± 0.52 mm
- **Gingival Angle (GA):** 88.93° ± 9.29°
- **Contact Surface Length (CS):** 1.36 ± 0.59 mm
- **Mesiodistal Width-to-Crown Length Ratio (MDW/CL):** 1.05 ± 1.07

These findings provide baseline morphological data for maxillary central incisors in a young Middle Eastern adult population and serve as a reference for aesthetic and periodontal considerations in prosthodontic treatment planning.

TABLE 3: DESCRIPTIVE FEATURES OF THE GIVEN VARIABLES BASED ON INCISOR SHAPES

		N	Mean	Std. Deviation	Std. Error
INTERDENTAL PAPILLA HEIGHT(PH)	Tapper	19	1.2526	0.54505	0.12504
	Ovoid	39	1.6538	0.58842	0.09422
	Square	62	1.3968	0.42618	0.05412
	Total	120	1.4575	0.51948	0.04742
GINGIVAL ANGLE(GA)	Tapper	19	81.0421	10.61808	2.43596
	Ovoid	39	88.2667	8.58365	1.37448
	Square	62	91.7565	7.82898	0.99428
	Total	120	88.9258	9.28661	0.84775
CONTACT SURFACE(CS)	Tapper	19	1.2211	0.56232	0.129
	Ovoid	39	1.4205	0.55259	0.08849
	Square	62	1.3694	0.63131	0.08018
	Total	120	1.3625	0.59495	0.05431
MDW/CL	Tapper	19	0.7032	0.07422	0.01703
	Ovoid	39	0.8415	0.08923	0.01429
	Square	62	1.2857	1.45151	0.18434
	Total	120	1.0491	1.07041	0.09771
(CS)/(CL)	Tapper	19	0.265	0.11958	0.02743
	Ovoid	39	0.3029	0.10813	0.01731
	Square	62	0.3585	0.15545	0.01974
	Total	120	0.3256	0.14001	0.01278

Table 3 illustrates the mean values and standard deviations of gingival variables across different maxillary incisor shapes.

TABLE 4: ANOVA TEST RESULTS

		Sum of Squares	df	Mean Square	F	Sig.
INTERDENTAL PAPILLA HEIGHT(PH)	Between Groups	2.53	2	1.265	5.002	0.008
	Within Groups	29.584	117	0.253		
	Total	32.113	119			
GINGIVAL ANGLE(GA)	Between Groups	1694.625	2	847.312	11.57	0
	Within Groups	8568.065	117	73.231		
	Total	10262.69	119			
CONTACT SURFACE(CS)	Between Groups	0.514	2	0.257	0.723	0.487
	Within Groups	41.607	117	0.356		
	Total	42.121	119			
MDW/CL	Between Groups	7.426	2	3.713	3.37	0.038
	Within Groups	128.922	117	1.102		
	Total	136.348	119			
(CS)/(CL)	Between Groups	0.157	2	0.078	4.219	0.017
	Within Groups	2.176	117	0.019		
	Total	2.333	119			

Comparative Analysis

One-way Analysis of Variance (ANOVA) revealed statistically significant differences among the various tooth shape groups with respect to several parameters. Specifically:

- **Interdental Papilla Height (PH):** $P < 0.005$
- **Gingival Angle (GA):** $P < 0.05$
- **Mesiodistal Width-to-Crown Length Ratio (MDW/CL):** $P < 0.05$
- **Contact Surface-to-Crown Length Ratio (CS/CL):** $P < 0.05$

These findings indicate that variations in tooth morphology are significantly associated with differences in both gingival and dental anatomical characteristics.

TABLE 5: GAMES -HOWELL POST HOC ANALYSIS

Table 5: Post Hoc

Multiple Comparisons

Dependent Variable		(I) newshape	(J) newshape	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
INTERDENTAL PAPILLA HEIGHT(PH)	Games-Howell	Tapper	Ovoid	-.40121*	0.15657	0.038	-0.7829	-0.0195
			Square	-0.14414	0.13625	0.548	-0.4834	0.1951
		Ovoid	Tapper	.40121*	0.15657	0.038	0.0195	0.7829
			Square	0.25707	0.10866	0.054	-0.0038	0.5179
		Square	Tapper	0.14414	0.13625	0.548	-0.1951	0.4834
			Ovoid	-0.25707	0.10866	0.054	-0.5179	0.0038
GINGIVAL ANGLE(GA)	Games-Howell	Tapper	Ovoid	-7.22456*	2.79698	0.039	-14.1216	-0.3275
			Square	-10.71435*	2.63106	0.001	-17.2796	-4.1491
		Ovoid	Tapper	7.22456*	2.79698	0.039	0.3275	14.1216
			Square	-3.48978	1.69641	0.106	-7.5457	0.5662
		Square	Tapper	10.71435*	2.63106	0.001	4.1491	17.2796
			Ovoid	3.48978	1.69641	0.106	-0.5662	7.5457
CONTACT SURFACE(CS)	Games-Howell	Tapper	Ovoid	-0.19946	0.15643	0.418	-0.5822	0.1833
			Square	-0.1483	0.15189	0.597	-0.5209	0.2243
		Ovoid	Tapper	0.19946	0.15643	0.418	-0.1833	0.5822
			Square	0.05116	0.11941	0.904	-0.2335	0.3358
		Square	Tapper	0.1483	0.15189	0.597	-0.2243	0.5209
			Ovoid	-0.05116	0.11941	0.904	-0.3358	0.2335
MDW/CL	Games-Howell	Tapper	Ovoid	-.13827*	0.02223	0	-0.1923	-0.0843
			Square	-.58251*	0.18513	0.007	-1.027	-0.138
		Ovoid	Tapper	.13827*	0.02223	0	0.0843	0.1923
			Square	-.44425*	0.1849	0.05	-0.8883	-0.0002
		Square	Tapper	.58251*	0.18513	0.007	0.138	1.027
			Ovoid	.44425*	0.1849	0.05	0.0002	0.8883
(CS)/(CL)	Games-Howell	Tapper	Ovoid	-0.03784	0.03244	0.481	-0.1175	0.0418
			Square	-.09346*	0.0338	0.023	-0.1759	-0.0111
		Ovoid	Tapper	0.03784	0.03244	0.481	-0.0418	0.1175
			Square	-0.05562	0.02626	0.091	-0.1181	0.0069
		Square	Tapper	.09346*	0.0338	0.023	0.0111	0.1759
			Ovoid	0.05562	0.02626	0.091	-0.0069	0.1181

*. The mean difference is significant at the 0.05 level.

Games-Howell post hoc analysis revealed statistically significant differences between various incisor shapes as follows:

- **Papilla Height (PH):** Significant difference observed between **taper** and **ovoid** shapes ($P < 0.05$).
- **Gingival Angle (GA):** Significant differences noted between **taper** and **ovoid** ($P < 0.05$), and **taper** and **square** ($P < 0.05$).
- **Mesiodistal Width-to-Crown Length Ratio (MDW/CL):** Significant differences found among **taper** and **ovoid**, **taper** and **square**, and **ovoid** and **square** incisor shapes (all $P < 0.05$).
- **Contact Surface-to-Crown Length Ratio (CS/CL):** A significant difference was identified between **taper** and **square** shapes ($P < 0.05$).

TABLE 6

Table 6 correlation

Correlations

		CW/ CL ratio	INTERDENTAL PAPILLA HEIGHT(PH)	GINGIVAL ANGLE(GA)	MDW/CL	(CS)/(CL)	CONTACT SURFACE(CS)
CW/ CL ratio	Pearson Correlation	1	-0.029	.354**	.293**	.254**	0.022
	Sig. (2-tailed)		0.751	0	0.001	0.005	0.815
	N	120	120	120	120	120	120
INTERDENTAL PAPILLA HEIGHT(PH)	Pearson Correlation	-0.029	1	-.205*	-0.034	.256**	.501**
	Sig. (2-tailed)	0.751		0.025	0.716	0.005	0
	N	120	120	120	120	120	120
GINGIVAL ANGLE(GA)	Pearson Correlation	.354**	-.205*	1	0.107	0.158	0.079
	Sig. (2-tailed)	0	0.025		0.243	0.085	0.393
	N	120	120	120	120	120	120
MDW/CL	Pearson Correlation	.293**	-0.034	0.107	1	.184*	0.011
	Sig. (2-tailed)	0.001	0.716	0.243		0.044	0.907
	N	120	120	120	120	120	120
(CS)/(CL)	Pearson	.254**	.256**	0.158	.184*	1	.817**
	Sig. (2-tailed)	0.005	0.005	0.085	0.044		0
	N	120	120	120	120	120	120
CONTACT SURFACE(CS)	Pearson Correlation	0.022	.501**	0.079	0.011	.817**	1
	Sig. (2-tailed)	0.815	0	0.393	0.907	0	
	N	120	120	120	120	120	120

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlation analysis of variables influencing incisor shape revealed several significant associations:

- **CW/CL ratios** showed significant correlations with **gingival angle**, **MDW/CL**, and **CS/CL** (all $P < 0.05$).
- **Interdental papilla height** was significantly associated with **gingival angle**, **CS/CL**, and **contact surface length** ($P < 0.05$ for all).
- **MDW/CL ratios** were significantly correlated with **CS/CL ratios** ($P < 0.05$), which, in turn, demonstrated a significant association with **contact surface length** ($P < 0.05$).

DISCUSSION

Understanding the typical morphology of teeth and gingival tissues is essential for achieving optimal aesthetic and functional outcomes in clinical practice. Comprehensive knowledge of intraoral structures—including the gingiva, mucosa, natural teeth, and overall dentition—is fundamental to successful prosthetic rehabilitation. The present study aimed to evaluate the shape and dimensions of the clinical crown of the maxillary central incisors and associated gingival characteristics in young Middle Eastern Asian adults, with the goal of establishing normative reference values to guide restorative planning. Previous research has consistently indicated that tooth dimensions can vary significantly across different ethnic groups.[8-14]

Several studies [1, 15-17] have classified anterior tooth morphology using the ratio of cervical width to crown length (CW/CL), recognizing it as a reliable parameter for tooth shape characterization. In contrast, another study[18] reported that the width-to-length ratio of the clinical crown exhibited minimal variation with respect to gender and height, although males generally possessed longer and wider anterior teeth than females. These findings suggest that the CW/CL ratio may serve as a stable and consistent reference for evaluating anterior tooth form in clinical settings.

Cluster analysis has proven valuable in clinical research as a method to objectively categorize large and complex populations into more manageable subgroups. However, it is primarily regarded as a descriptive and exploratory tool, and its findings should ideally be validated in independent populations.[19] In

the present study, cluster analysis was employed to fulfill one of the primary objectives: to confirm the existence of three distinct maxillary central incisor shapes and to quantify their relative prevalence. Given that tooth size and morphology have been shown to vary across different ethnic groups,[3,15] the study sample was deliberately restricted to individuals of Middle Eastern Asian descent to ensure population homogeneity and increase the reliability of the results.

Our study observed that tapered crowns exhibited shorter interdental papilla height, narrower gingival angles, and smaller contact surface areas compared to other crown forms. Statistically significant differences were identified among the three crown shape categories—tapered, ovoid, and square—in relation to interdental papilla height, gingival angle, the mesiodistal width-to-crown length (MDW/CL) ratio, and the contact surface-to-crown length (CS/CL) ratio.

Consistent with previous studies[2,3,15,20-22] our findings reinforce the association between the morphological characteristics of the periodontal tissues and clinical crown shape in the maxillary anterior region. Earlier research has suggested that the cervical width-to-crown length (CW/CL) ratio serves as a reliable metric for distinguishing periodontal biotypes.[15-17, 23] In alignment with these findings, we used the CW/CL ratio to classify tooth shape and then analyzed corresponding gingival morphology.

Correlation analysis in our study revealed that a lower CW/CL ratio—indicative of tapered crowns—was significantly associated with increased interdental papilla height. This suggests that tapered teeth are commonly associated with scalloped gingival architecture, while square teeth tend to be associated with flatter gingival forms. Interestingly, our results also showed significant correlations in papilla height not only between tapered and ovoid shapes, but also between ovoid and square forms, indicating that ovoid teeth may represent a transitional form with variable gingival expression.

Furthermore, interdental papilla height was significantly correlated with gingival angle, CS/CL ratio, and contact surface length. These findings are in agreement with previous literature, which has similarly concluded that the shape of maxillary central incisor crowns is closely related to papillary height and the overall gingival contour. In addition, the narrow gingival angle observed in tapered crowns was significantly correlated with both ovoid and square crowns, indicating that tapered crowns exhibit a more pronounced gingival curvature. Similarly, Weisgold et al[24,25] suggested that long tapering teeth are more susceptible to gingival recession, whereas square teeth tend to have a broader zone of gingiva that is more resistant to recession.

The tooth shape that determines the most apical point of the contact area is an important factor in restorative treatment within the esthetic zone. However, the literature lacks clear criteria for defining a true tapered or square tooth. Gobatto et al. (2012) [26] conducted a study comparing the contact surface to crown length (CS/CL) ratio among various tooth shapes with minimal subjectivity. They concluded that if the CS is less than 43% of the CL, the tooth is triangular/tapered in shape; if the CS is greater than 57% of the CL, the tooth is square. In our study, no significant association was found between contact surface measurements among the three tooth shapes. However, there was a significant correlation in the CS/CL ratio when comparing tapered and square shapes, despite the mean CS/CL values not differing substantially across the three groups. Tapered tooth forms have smaller contact surfaces compared to square forms, making this association logical. As demonstrated by Gobatto et al,[26] the greater the gingival angle (GA), the greater the crown width (CW) and the higher the CS/CL ratio. In other words, an increased crown width results in a larger contact surface.

The results of this study also have important implications for periodontal surgery, including crown lengthening, full-coverage restorations placed at or apical to the gingival margin, and dental implant placement. Understanding tooth shape prior to periodontal surgery is a crucial factor in treatment planning to achieve optimal esthetic outcomes. For example, in ovoid teeth, the gingival papilla often does not completely fill the embrasure space. Consequently, replacing an ovoid central incisor with a single restoration—while leaving the adjacent central incisor unchanged—may lead to less than ideal esthetics due to black triangles or asymmetrical crown shapes. Anticipating these treatment limitations by carefully considering the morphological characteristics of the gingiva and tooth shape is an essential part of the treatment planning discussion with the patient from an esthetic perspective.

CONCLUSION

This study investigated the clinical crown shapes of maxillary central incisors in a Middle East Asian population. Within the limitations of this investigation, the following conclusions can be drawn:

- Maxillary central incisors were classified as tapered, square, or ovoid based on the relationship between crown length and crown width, with the square type being the most prevalent.
- Tooth shapes showed strong correlations with several gingival parameters, including interdental papilla height, gingival angle, the ratio of mesiodistal width to crown length, and the contact surface to crown length ratio. These relationships can serve as a foundation for esthetic restoration of the maxillary central incisor.

REFERENCES

- *Jeong DK, Kim KH, Park JM, Chang MT, Kim HS. A relationship between interdental papilla existence and the distance from contact point to interdental alveolar crest in the maxillary anterior dentition of Korean adults. J Korean Acad Periodontol 2001;31:633-40.*
- *Kim SH, Chung HJ. The relationship between clinical crown form and gingival feature in upper anterior region. J Korean Acad Periodontol 2005;35:761-76.*
- *Olsson M, Lindhe J. Periodontal characteristics in individuals with varying form of the upper central incisors. J Clin Periodontol 1991;18:78-82*
- *Müller HP, Heinecke A, Schaller N, Eger T. Masticatory mucosa in subjects with different periodontal phenotypes. J Clin Periodontol 2000;27:621-6.*
- *Townsend GC, Brown T. Heritability of permanent tooth size. Am J Phys Anthropol 1978;49:497-504*
- *Garn SM, Lewis AB, Kerewsky RS. Sex difference in tooth size. J Dent Res 1964;43:306*
- *Oh SC. A study on morphology and size of clinical crown of permanent mandibular molar in Korean adult. J Korean Acad Prosthodont 1999;37:242-55*
- *Morrow LA, Robbins JW, Jones DL, Wilson NH. Clinical crown length changes from age 12-19 years: a longitudinal study. J Dent 2000;28:469-73.*
- *Al-Khatib AR, Rajion ZA, Masudi SM, Hassan R, Anderson PJ, Townsend GC. Tooth size and dental arch dimensions: a stereophotogrammetric study in Southeast Asian Malays. Orthod Craniofac Res 2011;14:243-53.*
- *Corruccini RS. Molar cusp-size variability in relation to odontogenesis in hominoid primates. Arch Oral Biol 1979;24:633-4.*
- *Garn SM, Lewis AB, Swindler DR, Kerewsky RS. Genetic control of sexual dimorphism in tooth size. JDent Res 1967;46:963-72.*
- *Jensen E, Kai-Jen Yen P, Moorrees CF, Thomsen SO. Mesiodistal crown diameters of the deciduous and permanent teeth in individuals. J Dent Res 1957;36:39-47.*
- *Sofaer JA, Chung CS, Niswander JD, Runck DW. Developmental interaction, size and agenesis among permanent maxillary incisors. Hum Biol 1971;43:36-45.*
- *Reid C, van Reenen JF, Groeneveld HT. Tooth size and the Carabelli trait. Am J Phys Anthropol 1991;84:427-32.*

- *Nam JH, Lee KS. A study of mandibular dental arch form of the Korean with normal occlusion. Korean J Orthod 1996;26: 535-46.*
- *Paik KS, Kim KM. A statistical study on morphology and size of the maxillary cenrtral incisor in Korean adult. Korean J Oral Anat 1988;12:37-42.*
- *Müller HP, Eger T. Masticatory mucosa and periodontal phenotype: a review. Int J Periodontics Restor Dent 2002;22: 172- 83.*
- *Sterrett JD, Oliver T, Robinson F, Fortson W, Knaak B, Russell CM. Width/length ratios of normal of the maxillary anterior dentition in man. J Clin Periodontol 1999;26:153-7*
- *Cohen ME.On the interpretation of microbial clusters in periodontal disease. J_ Periodontal Res 1997;32:47-53.*
- *Wheeler RC. Complete crown form and the periodontium. J Prosthet 1961;11:722-34.*
- *Ericsson I, Lindhe J. Recession in sites with inadequate width of the keratinized gingiva. An experimental study in the dog. J Clin Periodontol 1984;11:95-103.*
- *An CH, Heo SR, Cho IH, Kim HS. Clinical features of the gingiva according to maxillary anterior teeth form in adult. J Korean Acad Periodontol 2005;35:359-69.*
- *Stellini E, Comuzzi L, Mazzocco F, Parente N, Gobbato L. Relationships between different tooth shapes and patient's periodontal phenotype. 2013; doi: 10.1111/jre.12057. © 2013 John Wiley & Sons A/S. Published by Blackwell Publishing Ltd.*
- *Weisgold AS Contours of_the full crown restoration. Alpha.Omegan 1977;70:77-89_._ _*
- *Weisgold AS, Arnoux JP, Lu J.Single-tooth anterior implant: A word of caution. Part I. J Esthet Dent 1997;9:225*
- *Gobbato, Luca & Tsukiyama, Teppei & Levi, Jr, Paul & Griffin, Terrence & Weisgold, Arnold. (2012). Analysis of the Shapes of Maxillary Central Incisors in a Caucasian Population. The International journal of periodontics & restorative dentistry. 32. 69-78.*