

COINCIDENCE OF MAXILLARY DENTAL MIDLINE WITH THE ALA–CANTHUS INTERSECTION POINT AMONG DENTAL STUDENTS

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INTRODUCTION

Aesthetics is a primary concern in dentistry, particularly in Prosthodontics, as it motivates patients to seek treatment. In relation to one's age, the term "aesthetics" connotes beauty, naturalness, and a youthful appearance.¹ Improving facial aesthetics is one of the main objectives of dental treatment.² An aesthetically pleasing and well-balanced smile plays a crucial role in the overall success of dental treatment.³ People with aesthetically appealing smiles have a greater chance of being socially accepted, ensuring better interpersonal relations.⁴ Dental aesthetics is increasingly focused on creating harmony between facial features and dentition.⁵ Symmetry refers to the balanced arrangement of structures in terms of size, shape, and position on both sides of a central line, median plane, or around a central axis.^{6,7} Asymmetry of the dental midline and the extent to which deviation is considered acceptable have been thoroughly explored in the literature.⁸ Patients are more likely to notice midline discrepancies compared to other dental and occlusal asymmetries.⁹ Creation of a symmetrical dental midline is a prerequisite in the arrangement of the anterior teeth during fixed or removable dental prosthesis fabrication.¹⁰ The optimal aesthetic outcome is achieved

when the dental and facial midlines are both aligned and parallel.¹¹ Faiz et al. reported that the coincident alignment of the facial and dental midlines occurred in approximately half of their study population, whereas the remaining cases demonstrated non-coincidence.¹² Although the assessment of facial midline has been widely investigated, alternative facial landmarks for determining dental midline remain underexplored. In another study conducted by Niraula et al., 44 (30%) of 150 Nepalese subjects showed coincidence of the facial midline with only the maxillary dental midline. The dental midline discrepancy relative to the facial midline was more prevalent in the maxillary arch. Midline discrepancy was more common in males than in females. The majority of the deviation was 1 mm, followed by 2 mm and 3mm.¹³ Although a different landmark was used, Eskelsen et al. studied the bisector of the interpupillary line as a reference for dental midline determination in 102 subjects, among whom 12 (11.76%) males and 27 (26.47%) females demonstrated coincidence.¹⁴ The ala–canthus line connects the ala of the nose to the outer canthus of the eye, both of which are stable, easily identifiable soft tissue landmarks on the mid-facial region. The intersection point of bilateral ala–cantus lines provides a reproducible chairside reference that may correspond to the maxillary dental

ABSTRACT

OBJECTIVES

This study aimed to determine the frequency of dental midline coincidence with the ala–canthus intersection point.

METHODOLOGY

A cross-sectional study was conducted at the department of Prosthodontics, Khyber College of Dentistry, Peshawar, from January to June 2025. A total of 86 dental students, both male and female, were included in the study. Facial portrait photographs were taken with a DSLR camera while smiling. Photoshop software CC 2019 version 20.0 was used to analyze the coincidence of the dental midline with the intersection point of ala–canthus lines. Data were analyzed using SPSS version 22.0. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test, where appropriate. A p-value < 0.05 was considered statistically significant.

RESULTS

The coincidence of the maxillary dental midline with the ala–canthus intersection point was observed in 33.72% (29/86) of participants.

CONCLUSION

Maxillary dental midline coincidence was observed in only one-third of participants. The dental midlines were coincident with the intersection point of ala–canthus lines in less than half of the sample.

KEYWORDS: Coincidence, Dental Midline, Ala–Canthus Lines, Intersection Point

midline, which is critical in prosthodontic rehabilitation and aesthetic dental practice, where even minor deviations can compromise facial harmony and patient satisfaction. Despite this potential, there is limited evidence regarding the use of the ala-canthus intersection point as a reference for dental midline assessment. To the best of our knowledge, this is the first study to specifically evaluate its coincidence with the maxillary dental midline across demographic and morphological variables, highlighting the need for further investigation.

METHODOLOGY

This cross-sectional study was conducted at the department of prosthodontics from January to June 2025, after obtaining Institutional Review Committee approval, Ref No. 48/ADR/KCD, Dated: 03-08-2023, bearing CPSP approval number Ref no: CPSP/REU/DSG-2021-019-3770. Dental students aged 18-30 years who provided informed consent were included. Participants were required to have all maxillary and mandibular anterior teeth present and no restorations involving the anterior teeth. Individuals with generalized spacing, crowding, retained deciduous teeth, supernumerary teeth, malposed teeth, previous orthodontic treatment involving the anterior region, visible facial asymmetry, cleft lip, or facial scars were excluded. A sample size of 86 participants was calculated using the WHO sample size calculator, assuming a prevalence of 12.5%, a 95% confidence level, and a 7% margin of error. Eligible participants were enrolled using convenience sampling. Dental students were selected because they met the eligibility criteria more consistently, including intact anterior teeth and a relatively uniform age range. Patients presenting to the Prosthodontics department frequently had missing, restored, or altered anterior dentition, which could influence the assessment of dental midline coincidence. Participants were seated upright with a horizontal gaze and natural head position. Frontal full-face smile photographs were captured using a Canon DSLR camera (ISO: 100, Aperture: f/10, Shutter speed: 1/60-1/200s) mounted on a tripod at eye level. Three photographs were taken per subject, and the most accurate image demonstrating equal visibility of both eyes and alae with no visible asymmetry was selected for analysis. Facial form was assessed extraorally, and dental arch form was recorded intraorally prior to image capture. All photographs were captured using the same camera under standardized lighting conditions at a distance of 1.5m from the subject. Adobe Photoshop

CC 2019, version 20.0, was used to analyze the photographs. A line was drawn from the outer canthus of the eye to the ala of the nose on both sides of the face, and the point of intersection was marked. Coincidence of this point with the maxillary dental midline was assessed and defined as alignment within $\pm 1\text{mm}$. A single calibrated examiner performed measurements. Measurement reliability was assessed after a two-week interval on a randomly selected 20% subset of the total sample, and agreement for both intra-examiner and inter-examiner reliability was evaluated using Cohen's Kappa statistic. Data were analyzed using SPSS version 22. Frequencies and percentages were calculated for categorical variables. Associations were analyzed using the Chi-square test or Fischer's exact test where appropriate. A $p\text{-value} \leq 0.05$ was considered statistically significant. Results were presented in tables.

RESULTS

Intra-examiner reliability was almost perfect ($\kappa = 0.89$), and inter-examiner reliability demonstrated substantial agreement ($\kappa = 0.80$), indicating consistent and reproducible measurements across both examiners. Table 1 presents the distribution of study variables among the 86 participants. Males outnumbered females, and the majority of participants were in the 25-30 age group. Mesofacial was the predominant facial form, followed by brachyfacial and dolichofacial forms. Regarding arch form, ovoid was the most frequently observed, followed by tapering and square forms. The coincidence of the maxillary dental midline with the ala-canthus intersection point was observed in 29 of 86 participants (33.72%; 95% CI: 23.7%-43.7%).

Table 1: Frequency Distribution of Demographic and Morphological Characteristics of Study Participants

Characteristics	N = 86
Age	
18-24	38 (44.19%)
25-30	48 (55.81%)
Gender	
Female	24 (27.91%)
Male	62 (72.09%)
Facial form	
Mesofacial	73 (84.88%)
Brachyfacial	7 (8.14%)
Dolichofacial	6 (6.98%)
Arch form	
Ovoid	67 (77.91%)
Square	5 (5.81%)
Tapering	14 (16.28%)

Table 1: Association Between Biliary Dilatation and CT Severity Index (CTSI) Categories (n = 146)

Characteristics	Coincidence N = 29	No Coincidence N = 57	p-value
Age			
18-24	12 (41%)	26 (46%)	0.7
25-30	17 (59%)	31 (54%)	
Gender			
Female	9 (31%)	15 (26%)	0.6
Male	20 (69%)	42 (74%)	
Facial form			
Mesofacial	22 (76%)	51 (89%)	0.2
Brachyfacial	3 (10%)	4 (7.0%)	
Dolichofacial	4 (14%)	2 (3.5%)	
Arch form			
Ovoid	17 (59%)	50 (88%)	0.004
Square	2 (6.9%)	3 (5.3%)	
Tapering	10 (34%)	4 (7.0%)	
Total Coincidence	33.72%		

DISCUSSION

Although the facial midline has traditionally been considered the primary reference for evaluating maxillary dental midline position, recent studies suggest that its reliability may vary across populations.¹⁴ In the present study, the coincidence of the maxillary dental midline with the intersection point of the ala-canthus lines was observed in only 33.72% of participants, indicating that complete alignment is uncommon. Age was not significantly associated with maxillary dental midline coincidence in the present study ($p = 0.7$). This contrasts with Faiz et al., who reported a significant age-related association, possibly due to their broader age range and larger sample size, which may have increased the likelihood of detecting age-related differences.¹² Furthermore, the use of a different reference landmark in the present study limits direct comparison between the two findings. Gender was not significantly associated with maxillary dental midline coincidence in the present study ($p = 0.6$). Among participants who demonstrated coincidence, males showed a higher frequency than females, though this difference did not reach statistical significance. This finding is consistent with Maharjan et al., who reported no significant sex-based difference in facial-dental midline coincidence in a Nepalese population.¹⁵ Similarly, Melo et al. found no significant influence of sex on maxillary midline alignment in a prospective study of Caucasian patients.¹⁶ Maiti et al. also reported a non-significant sex difference in their cross-sectional analysis of maxillary and mandibular midline alignment in an Indian population.¹⁹ However, these studies

employed different reference landmarks, populations, and methodologies, which limit direct comparison. In contrast, Niraula et al. observed slightly greater midline deviation in males compared to females, suggesting a possible sex-related trend that may be population-specific.¹³ Facial form was not significantly associated with maxillary dental midline coincidence in the present study ($p = 0.2$). Among participants who demonstrated coincidence, mesofacial individuals accounted for the largest proportion (76%), followed by dolichofacial (14%) and brachyfacial (10%) forms. Since mesofacial was the predominant facial type in the sample, its greater representation in the coincidence group reflects the sample composition rather than a true association with facial form. Rakhshan et al. demonstrated that facial form significantly influences the perception of midline deviations among clinicians and laypeople, supporting the clinical relevance of facial form in midline evaluation.¹¹ However, the non-significant result in the present study ($p = 0.2$) is largely attributable to the disproportionately small dolichofacial ($n=6$) and brachyfacial ($n=7$) subgroups, which substantially reduced statistical power to detect any true association. Future studies with a larger, more balanced distribution across facial types are needed to draw definitive conclusions about the influence of facial form on ala-cantus midline coincidence. Arch form was the only variable significantly associated with maxillary dental midline coincidence in the present study ($p = 0.004$). Among participants demonstrating coincidence, the ovoid arch form accounted for the highest proportion (59%), followed by tapering (34%) and square (6.9%). However, since the ovoid was the predominant arch form in the sample (77.91%), its greater representation in the coincidence group reflects the sample's composition. The tapered arch form showed a disproportionately higher representation in the coincidence group than its prevalence in the sample (16.28%), suggesting a genuine association with midline coincidence. This finding is supported by Kostic et al., who demonstrated a significant relationship between dental arch shape and facial form, indirectly suggesting that arch morphology is a clinically relevant determinant of midline relationships.²⁰ The significant association observed here warrants further investigation in larger samples to establish arch form as a reliable predictor of midline coincidence with the ala-cantus intersection point. Compared with other populations, the coincidence rate of 33.72% is higher than that reported in a Peruvian population (23.3%) but lower than those in Saudi (57.5%) and North Bihar (80.6%) populations.^{17,18,21} However, these comparisons must be interpreted cautiously, as the referenced studies used the facial midline rather than the ala-cantus intersection point,

applied different coincidence thresholds, and employed distinct measurement methodologies, all of which limit direct comparison. Among the variables examined, only arch form demonstrated a statistically significant association with midline coincidence ($p = 0.004$), while age, gender, and facial form did not reach significance. Given that a coincidence was observed in only one-third of participants, clinicians should consider integrating multiple anatomical landmarks rather than relying solely on the ala-canthus intersection point for dental midline determination.

LIMITATIONS

Participants were selected by convenience sampling from a single dental student group, which may introduce selection bias and limit generalizability. The relatively small sample size may have reduced the strength of subgroup analyses. The use of two-dimensional imaging to assess an inherently three-dimensional anatomical relationship may have introduced measurement limitations and affected the accuracy of midline coincidence determination.

CONCLUSIONS

The coincidence of maxillary dental arch midlines with the intersection point of the ala-canthus lines was observed in only one-third of the participants. This indicates that complete alignment of dental and facial reference points is uncommon. Clinicians should consider multiple anatomical landmarks rather than rely solely on a single reference point when planning aesthetic or prosthodontic treatments to achieve optimal functional and cosmetic outcomes.

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Asif Ullah Khan - Concept & Design; Data Acquisition; Drafting Manuscript; Critical Revision; Final Approval

Aneela Jamshaid - Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval

Sana Saleem - Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval

Humna Ali - Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval

The authors accept responsibility for all aspects of the work and will ensure that any concerns regarding the accuracy or integrity of any part are properly investigated and resolved.



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