

Cephalo-photographic Evaluation of Lower Facial 3rd in Orthodontic Patients

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Abstract

Introduction: To evaluate the lower third of face in orthodontic subjects with normal profile on lateral cephalograms and photographs

Methodology: This Cross-sectional study was conducted at Orthodontic center of Fatima Jinnah Institute of Dental Sciences (FJIDS), Lahore, from 20.01.2026 to 19.04.2026, involving 60 Class I orthodontic subjects, 30 males and 30 females (18-24 years). Standardized lateral cephalograms and lateral profile photographs were obtained and analyzed using 8 linear and 2 angular measurements. Following this data collection was done and for each measurement, mean and standard deviation were calculated, for each standardized lateral cephalogram and photograph. t- test was applied for comparison.

Results: No statistically significant difference was found between cephalometric and photographic aesthetic evaluation of lower third of face in orthodontic subjects with normal profile.

Conclusions: It was concluded that there is no difference in aesthetic evaluation of lower third of face in orthodontic subjects with normal profile by using cephalometric radiographs or photographs.

Keywords: Aesthetic Analysis; Orthodontic; Cephalometrics

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Introduction

Cephalometrics and photography are two of the most important tools available to us for craniofacial diagnosis.¹

Cephalometrics is a mandatory part of diagnosis in clinical orthodontic practice because of its importance in treatment planning, depicting growth changes and in providing diagnostic information regarding skeletal, dental and soft tissue profile.²⁻⁴

Photographic analyses are cost effective and without any issues of radiation exposure as in difference radiographic imaging techniques. Clinical orthodontic photography could facilitate the diagnosis of orthodontic patients by allowing extraoral facial evaluation of the important features.⁵ Photographs assume even greater importance when proper equipment for cephalograms is lacking.⁶

Tajik⁷ evaluated lateral cephalograms of 38 Pakistanis with normal occlusion. According to his study Pakistani people on average presented a convex profile with dental procumbency, suggesting the existence of dental compensations for the underlying skeletal pattern. Lesser mandibular plane angle and flatter occlusal plane was also found.⁷ Shaikh described cephalometric norms of good-looking Pakistanis. According to this

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study Pakistani sample had lesser horizontal and vertical measurements, bimaxillary dental protrusion and prominent chin.⁸

The rationale of present study was that in the literature, various published researches are available concerning aesthetic evaluation of lower third of face in orthodontic subjects with normal profile by using cephalometric and photographic evaluation, whereas there is little information in local Pakistani context. This study may provide key information in orthodontic diagnosis and treatment planning by allowing aesthetic evaluation of lower third of face in orthodontic subjects with normal profile by cephalometric and photographic evaluation.

The aim of the study was to evaluate the lower third of face in orthodontic subjects with normal profile on lateral cephalograms and photographs.

Methodology

This comparative cross-sectional study was conducted at Orthodontic Department of FJIDS, Lahore, from 20.01.2026 to 19.04.2026, involving 60 Class I orthodontic subjects, 30 males and 30 females (18-24 years). A post-Hoc power analysis using G power indicated that total sample size 60 (30 per group) is sufficient at $\alpha=0.05$, power 0.80 and allocation ratio of 1. Sampling technique used was purposive sampling (Strict Selection criteria and limited data collection type).

The selection criteria were adults with an age range 16-25 years, and normal antero-posterior and vertical relationships as per lateral cephalograms. The patients having history of orthognathic or orthodontic treatment were excluded.

Subjects reporting at OPD, were clinically assessed by the Consultants/specialists. Standardized lateral cephalograms and lateral profile photographs were obtained in natural head position and analyzed. All the lateral

cephalograms were obtained by a single operator with same established standardized radiographic technique for lateral cephalometry. Lateral cephalograms were traced digitally using "Webceph" Web-based Orthodontic Analysis Software AssembleCircle Corp. Korea. Standardized facial-profile photographs were taken from a distance of 5 feet using DSLR camera (Canon) mounted on a tripod.

Various skeletal angles were measured to verify that the individuals were skeletally class I and normal angle cases. After establishing that the selected individuals are skeletally class I and normal angle cases, the cephalometric landmarks of soft tissue were marked on both lateral cephalograms and photographs followed by specific analyses for lower 3rd face (Figure I & II). Similar 8 linear and 2 angular measurements were obtained. The horizontal lip position was analyzed using Ricketts E-line and Holdaway H-line. The lower facial height and vertical lengths of lips and chin were calculated in order to study morphology of balanced aesthetic profile. Nasolabial and labiomental angles were also analyzed.

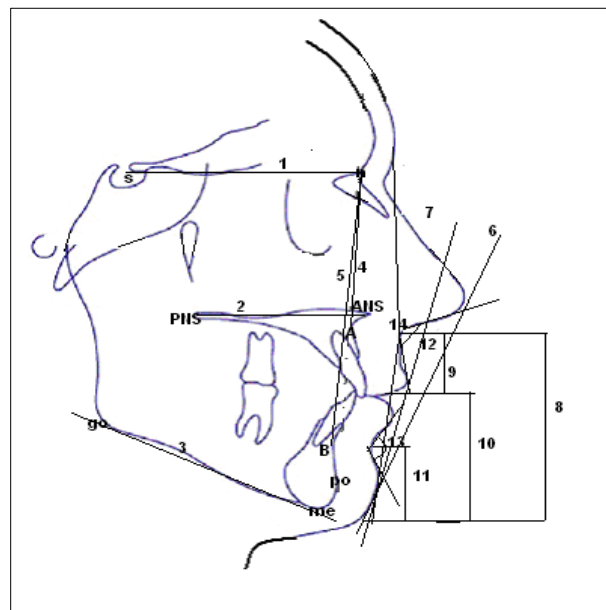


Fig. I: Cephalometric Angular & Linear Measurements

Landmarks: 1. SN Plane, 2. Palatal plane, 3. Mandibular plane, 4. NA line, 5. NB Line, 6. E-Line, 7. H-Line, 8. Lower facial height, 9. Upper lip length, 10. Lower lip length, 11. Chin length, 12. Nasolabial angle, 13. Labiomental angle, 14. Facial convexity angle.



Fig. II: Photographic Analysis

Landmarks: 1. Mentocervical angle, 2. Nasolabial angle, 3. Labiomental angle, 4. Facial convexity angle, 5. E-Line, 6. H-Line, 7. Lower facial height, 8. Upper lip length, 9. Lower lip length, 10. Chin length.

Statistical Analysis

Following this data collection was done and analyzed for each measurement using SPSS

(version 20.0), mean and standard deviation were calculated for each standardized lateral cephalograms and lateral profile photographs. t- test was applied for comparison. Method error was calculated by randomly selecting 20 cases using lottery method and verifying its difference between the first and 2nd tracings by applying paired t-test.

Result

A total of 60 subjects were included in this study, 30 males and 30 females. The mean age of the sample was 22.41 ± 2.33 years. The mean value for ANB was $2.61^\circ \pm 0.05^\circ$ which indicated Class I skeletal pattern of the sample and the mean value of SN-MP was $28.01^\circ \pm 1.40^\circ$ showing the normal vertical angle.

Table-I gives angular soft tissue characteristics of the sample by both cephalometric and photographic methods. The mean value for nasolabial angle indicated that for aesthetically pleasing faces, there is no lip protrusion in our sample. Table-II values suggested that the horizontal lip position of the sample was within the acceptable range of these parameters. Table-III gives the vertical measure of lower third facial height, upper and lower lip lengths and chin lengths. All these values suggest normal angle individuals with balanced soft tissue profile.

Parameter	Mean	SD	S.E.mean	t-value (paired t- test)	Df	p-value
NLA1	98.90	10.49	1.48	.410	59	.643
NLA2	98.83	10.14	1.43			
LMA1	121.15	9.11	1.18	-1.263	59	.222
LMA2	121.26	8.22	1.19			

Table-I: Comparison of Angular Measurements between Cephalometric and Photographic Methods

Parameter	Mean	SD	S.Emean	t-value	Df	p-value
Ls-E line1	-5.76	2.11	.27	-.39	59	.695
Ls-E line2	-5.34	2.33	.29			
Li-E line1	-2.67	2.62	.27	-.25	59	.799
Li-E line2	-2.11	2.31	.29			
Ls-H line1	.00	.00	.00			
Ls-H line2	.00	.00	.00			
Li-H line1	.44	1.25	.16	1.24	59	.219
Li-H line2	.51	1.27	.16			

Table-II: Comparison of Horizontal Lip Position between Cephalometric and Photographic Methods

Parameter	Mean	SD	S.Emean	t-value	Df	p-value
LFH1	65.77	5.56	.718	-.941	59	.351
LFH2	65.91	5.63	.727			
UL LENGTH1	21.32	2.64	.341	-1.211	59	.230
UL LENGTH2	21.34	2.64	.341			
LL LENGTH1	44.55	3.76	.486	-.135	59	.891
LL LENGTH2	44.34	3.89	.502			
CHIN1	27.65	2.87	.371	-1.333	59	.186
CHIN2	28.43	4.29	.555			

Table-III: Vertical Comparison of Lower Third Face between Cephalometric and Photographic Methods

Discussion

The objective of this study was to do aesthetic evaluation of lower third of face in orthodontic subjects with normal profile by using cephalometric and photographic evaluation.

In the past, many studies have been carried out to evaluate features of lower third of face by either cephalometry or photographic technique. Very few studies have incorporated both the diagnostic methods together.¹⁰⁻¹⁵

In the present study, the mean value for the cephalometric nasolabial angle with males had slightly larger values as compared to females. In the present study, the mean value for the photographic nasolabial angle was $97.83^\circ \pm 11.14^\circ$. The males had a mean value of $99.70^\circ \pm 11.16^\circ$, with males had slightly larger values as compared to females. No statistically significant difference was found between

cephalometric and photographic methods ($p=.684$), in doing aesthetic evaluation of lower third of face using nasolabial angle. The results of the present study are in accordance with the values for nasolabial angle as found by Tajik⁷ and as published by Shaikh⁸.

In this study, the value measured for the cephalometric labiomental angle was $120.15^\circ \pm 9.21^\circ$ and for photographic LMA was $120.26^\circ \pm 9.22^\circ$ respectively. $120.15^\circ \pm 9.21^\circ$ value is in close agreement with that of others.¹⁶⁻²⁰

In the present study, the mean values of cephalometric Ls-E line were $-5.13\text{mm} \pm 2.10\text{mm}$ and for photographic E-line was $5.10\text{mm} \pm 2.28\text{mm}$. The Cephalometric means for Ls- E lines for males were $-5.58\text{mm} \pm 1.88\text{mm}$ and for females was $-4.68\text{mm} \pm 2.25\text{mm}$ and the p value was .098. Photographic means for Ls- E line 2 for males was $-5.61\text{mm} \pm 1.88\text{mm}$ and for

females were $-4.60\text{mm} \pm 2.55\text{mm}$ and the p value was .084. These results are indicative that the upper lips are slightly more retrusive from the Ricketts values of $-4\text{mm} \pm 2\text{mm}$.¹⁶ May be this difference is due to the mean age of the sample selected which is greater than reported by Ricketts.¹⁷

These values are in accord with those for the males and females of Tajik's⁷ study ($-5.50\text{ mm} \pm 3.41\text{mm}$ and $-4.31\text{ mm} \pm 2.94\text{mm}$ respectively). Similar values were noted in study of Shaikh⁸ for Ls-E line for males and females ($-5.4\text{ mm} \pm 3\text{mm}$ and $-5.0\text{ mm} \pm 2\text{mm}$ respectively). Ahmad F¹⁷ also presented a mean value for Ls-E line in the males of $-5.12\text{mm} \pm 1.64\text{mm}$ and for the females of $-3.98\text{mm} \pm 1.34\text{mm}$, both these values are quite similar to our results.

There are several limitations of this single centric cross sectional study however within the limitations of this study the results showed no significant difference between the cephalometric and photographic methods for aesthetic evaluation of lower third of face.

Conclusion

It was concluded that there is no difference in aesthetic evaluation of lower third of face in orthodontic subjects with normal profile by using cephalometric radiographs or photographs.

Ethical Approval

The study was approved by the Ethical Review Board of Fatima Jinnah Institute of Dental Sciences (FJIDS), Lahore (Ref No. DME-RC-IRB/FJIDS/004/2025)

Funding Declaration

This study received no grant from any funding agency, commercial, or not-for-profit sectors.

Conflict of Interest

It is declared that the authors don't have any conflict of interest.

Authors' Contribution

MA: Data recording and analysis, conceiving and designing the study

NE: Critically reviewed the manuscript and final editing

AIM: Critically reviewed the manuscript

AA: Data Analysis and final editing/reviewing the article

RA: Critically reviewed the manuscript, Data Analysis

NZ: Critically reviewed the manuscript and designing the study

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