Nasolabial Angle-A: Correlation Between Anatomic Point Tracing Method and Mean Tangential Lines Tracing Method

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ABSTRACT

Objective: To determine the correlation between mean Nasolabial Angle between anatomic point tracing method and mean tangent lines tracing method.

Study Design: Cross-sectional study.

Place and Duration of Study: Military Dental Centre, Combined military Hospital, Malir Cantonment Karachi Pakistan, from Jan to Jun 2022.

Methodology: A total of 30 patients were included in the study. Acquired tracings were photocopied 4 times (out of these 4 tracings, 2 were used for tracing nasolabial angle by drawing anatomic landmarks method and other 2 were used for finding nasolabial angle through the tangential method). First two copies were used to trace cephalometric tracing to evaluate nasolabial angle by the same investigator using anatomic landmarks point method and tangential method after interval of 4 weeks for purpose of inspecting intra observer reproducibility.

Results: Patients ranged between fifteen to twenty-five years of age with mean age of 19.6±2.8 years. Out of these patients 19(63%) were males and 11(36.7%) were females. Value of mean anatomic point tracing method was 98.5±2.6 and tangent line tracing method was 90.3±5.0. Pearson correlation coefficient between mean nasolabial angle by both of these above-mentioned methods was r=0.381 with a significant *p* value (*p*=0.038).

Conclusion: After assessment of data obtained, it was established that there was a correlation between both methods of evaluating of nasolabial angle.

Keywords: Anatomy, Anatomic point tracing method, Nasolabial, Tangent line tracing method.

INTRODUCTION

A main impetus for pursuing any cosmetic treatment i.e. orthodontic therapy is an ambition to augment facial and dental esthetics.[1] Facial coherence and poise is depiction of its bony and soft tissues enclose.[2] Furthermore societal acceptance, psychological wellbeing, and the confidence of an individual are related to facial and physical appearance and now it is well recognized that self-esteem is intensely dependent on facial appearance.[3] One of the major determinants of orthodontic assessment and treatment planning is the evaluation and quantification of the facial soft tissues, particularly of patient's profile esthetics[4] so that the variation of profile norms and values can be incorporated in a treatment plan formulated to normalize facial traits for a given individual.[5] Studies targeting facial profiles have elaborated that facial equilibrium is of utmost importance. This proportionality in the face is a result of the delicate balance between facial organs like nasal form, upper lip contour and chin outline.[6] The nasolabial angle, a depiction of proportion of lips prominence with respect to nasal tip has crucial significance even when it is considered as independent and sole variable. It has been shown that the relative position of maxilla in anterio-posterior plane of space, owing to having an impact on treatment, can be demarcated by value of nasolabial angle, hence highlighting the importance of this angle.[7] However, methods for reproducible and consistent values of nasolabial angle in contemporary practice are lacking. Literature and cephalometric methodology has multiple methods of drawing this angle. One method is to connect cephalometric anatomic points including the anatomical landmarks identified along the soft tissue contour, while other method is to join soft tissue contours via tangents. Due to inherent marked difference in drawing method of this angle, there is a

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definite variation in values of this angle ranging from 90 to 124 in different studies.[8] These variations in the value of the nasolabial angle may result not only because of the specific measurement technique used but also from other sources of variation in cephalometric tracings and measurements.[9,10] The importance of comparing these measurement techniques and a dearth of similar studies in our region forms the rationale for this study.

METHODOLOGY

This Cross-sectional study was accomplished at 22 Military Dental Centre, Malir, Combined Military Hospital, Karachi Pakistan, from January to June 2022 after approval from Institutional Review Board.

Inclusion Criteria: Individuals of either aged 15-25 years with 28 permanent teeth intact in Class I, Class II and Class III dental relationship with no history of congenital dentofacial defect were included.

Exclusion Criteria: Individuals with facial asymmetries, history of orthognathic treatment/ orthognathic surgery, history of any dental or facial trauma, cleft lip and palate and syndromes were excluded from study. Individuals with nasal and lip deformities and those with multiple teeth missing especially anterior ones, impacted teeth i.e. incisors and canines were also not included.

The sample size was determined using WHO sample size calculator. Data was collected using non-probability consecutive sampling technique. The lateral cephalograms were taken using the same machine in natural head position after consent of the patient, which were then traced by primary investigator on a frozen acetate paper of dimensions 17.5x17.5cm and 0.07mm thickness in a dark room over a light illuminating view box with use of following material: 1) 0.3mm diameter lead pencil, 2) A thin ruler having 0.5mm demarcations, 3) An ordinary protractor having 1 minimum estimation; 4) An adhesive tape.

In order to avoid any errors resulting from retracing of same lateral cephalogram, four replicas of every tracing was made, using photocopier machine, so that two tracings would be made available for each method of drawing the angle. Out of these four tracings, two were used for tracing nasolabial angle by drawing anatomic landmarks method and other two were used for finding nasolabial angle through the tangential method by the same primary investigator after giving a pause of four weeks with the purpose of purpose of inspecting intra observer reproducibility.

Nasolabial angle was formed here between base of the nose and upper lip utilizing both of the above mentioned methods

Through anatomic tracing method, first few soft tissue landmarks were identified. Nasolabial angle can be traced by joining three anatomic points of lateral cephalogram i.e. subnasal, labrale superius and pronasale. A straight line was extended from pronasal and subnasal. This line was intersected by another line joining the subnasal and labrale superius. Angle formed by this intersection at subnasal was termed as anatomically defined nasolabian angle. All three points that were taken for anatomic nasolabial angle i.e. subnasal, pronasale and labrale superius were soft tissue points on lateral cephalogram

In tangential method of tracing nasolabial angle subject angle can be traced be by drawing tangents to nasal border and lip countours. The first tangent was drawn at lower border of nose and this was intersected by another tangent drawn on contours of lip as

shown in Figure-1 and Figure-2[11]. The angle formed by subsequent intersection was termed as nasolabial angle.
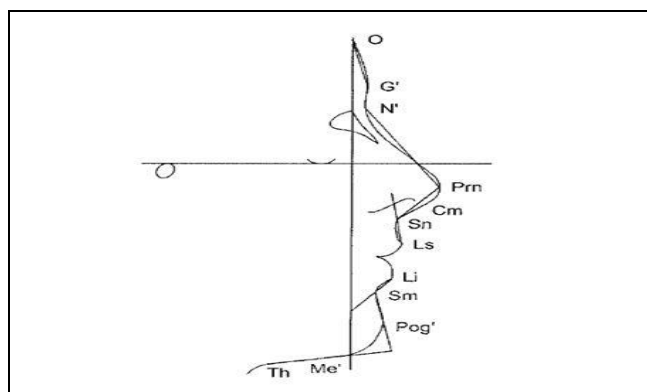

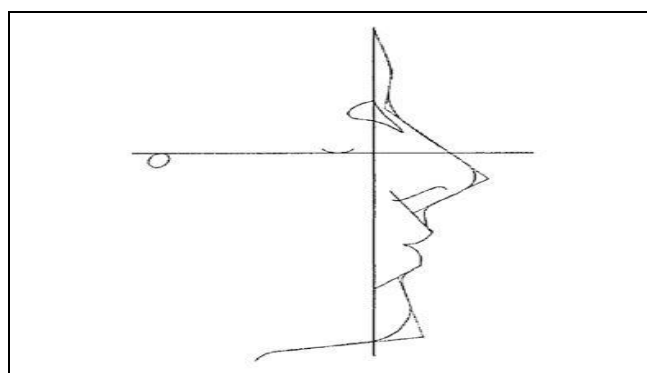**Figure-1: Anatomic Method of Tracing Nasolabial Angle**

Figure-2: Tangential Method of Tracing Nasolabial Angle

After compilation of values of nasolabial angle the data was assessed by Statistical Package for Social Sciences (SPSS) version 20.0. Descriptive statistics used to evaluate the mean and standard deviation for variable nasolabial angle, anatomic point tracing method and tangent line tracing method. Qualitative variables like gender were measured as frequency and percentages. Pearson correlation coefficient was calculated between mean nasolabial angle by anatomic landmark point tracing and tangent line tracing method. The p value of ≤0.05 was taken as significant.

RESULTS

A total of 30 patients were included in this study during the study period of six months. Patients' age ranged between 15-25 years with mean age of 19.6±2.8 years. There were 19 males (63.3%) and 11 females (36.7%). Mean value of anatomic point tracing method was 98.5±2.6 and tangent line tracing method was 90.3±5.0 (Table-I). Pearson correlation coefficient between mean value of this angle by using anatomic landmarks point method and tangential method was positive r=0.381 with p value p=0.038 (Figure-3). Female had positive correlation correlation of anatomic landmarks point method and tangential method r=0.749 with significant p value p=0.008 as compare to male r=0.215 with non-significant p value =0.378 shown in Table-II.

Table-I: Mean values of Anatomic Point and Tangent Line Method (n=30)

Variables	Mean±SD
Anatomic Point Tracing Method	98.5±2.6
Tangent Line Tracing Method	90.3±5.0

Table-II: Pearson Correlation Coefficient Between Nasolabial Angle by Anatomic Point and Tangent Line Method according to Gender (n=30)

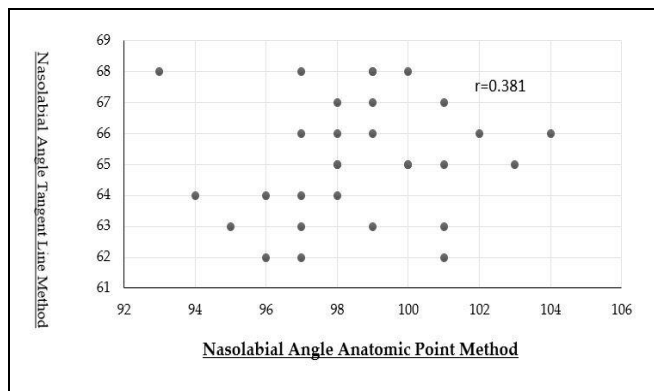| Males	Pearson Correlation Coefficient	0.215
	p-value	0.378
Females	Pearson Correlation Coefficient	0.749
	p value	0.008

Figure-3: Pearson Correlation Coefficient Between Mean Nasolabial Angle by Anatomic Point and Tangent Line Method

DISCUSSION

Fundamental intentions of new doctrine in orthodontics are to manage treatment in such a way that final soft tissue relationship at end of treatments should be in acceptable range.[12] A marked discriminating element of new treatment modality from old one is that along with lateral cephalogram, clinical examination to reveal directly association of soft tissues and profile is now main instrument of assessment[13]. Relative position of soft tissue organs for example lips and nose, though observed clinically, are actually measured through various parameters of cephalometirc analysis. Out of these parameters nasolabial angle is among very decisive components while charting out problem areas and solution list for patients.[14,15] Upper lip in human rests on maxillary incisors; hence this angle depicts relative position of maxillary dentition along with labiolingual inclination of incisors.[16]

Main dilemma that rests with this otherwise a very credible angular measurement is absence of sound and concrete measurement method. Impact of improper construction and reading of this angle can lead to alteration of treatment plan and with unfortunate consequences in treatment results[17]. New diagnostic and treatment strategy now focus on soft facial tissue so that these may have pleasing and balanced proportion at the end of treatment.[18,19]

Lateral cephalogram, which is a two-dimensional image, undergoes cephalometric analysis to apprehend structural relationship in tangible form so that measurements of structures can be made.[20] This operation involves manoeuvring the outlines of non collinear facial structure through radiograph tracing into angles and straight lines. Among other various factor which can affect accuracy of repeating these readings most important ones are diversity of methods and variation of observer.[21,22]

Thus, when considering results of these methods, one should not keep human errors out of sight. After consulting literature, one prevuius study who probed into matter of comparison of two different methods of tracing nasolabial angle was discovered. In terms of outcome, this exploration of cephalometry was in consonance with our study.[23]

This investigation revealed magnificent inter-observer reproducibility of both the methods of tracing this angle. This finding is in consensus with the finding of a Nepali study by Giri *et al*. which reported that this

angle can be measured by either of two methods and both methods are reproducible.[10]

Acceptance of both method for tracing nasolabial as credible methods is not a universal rule, since there are few investigations that have graded anatomic landmark points tracing method as superior in terms of reliability and reproducibility. A possible explanation of this variation in results lies in mechanism of sketching tangents at nasal and lip surfaces.

LIMITATIONS OF THE STUDY

A major limitation of the study is use of two-dimensional X-ray i.e. lateral cephalogram. Continuous progress in three-dimensional radiography for example CBCT demands that same issue should be studied in 3-D radiography or photography. Also, further light should be shed on issue of other definitions of nasolabial angle along with normal range of this angle in Pakistani population.

CONCLUSION

We found that Pearson correlation was 0.381 with p value 0.038, it is safe to assume that there was correlation between anatomic landmarks tracing technique and tangent lines tracing technique, hence both methods of tracing and reading nasolabial angle can be implemented in practice.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

KI & TSC: Conception, study design, drafting the manuscript, approval of the final version to be published.

AAK & AJ: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

JIB, KW: Data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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