Evaluation of nasal profile changes during orthodontic treatment in first premolar extraction cases.

Dr.Shaji. T. Varghese[1], Dr. RizwanaNazarP.S[2], Dr.Lijo K Jose[3], Dr. Hrudya Balachandran[4], Dr. Varun[5]Dr.Binu George[6], Dr. Sruthy Kuttappa[7]

[1]Professor &HOD, Department of Orthodontics, PSM Dental College / KUHS, Kerala, India
[2]Post graduate student, Department of Orthodontics, PSM Dental College / KUHS, Kerala, India
[3]Professor, Department of Orthodontics, PSM Dental College / KUHS, Kerala, India
[4]Reader, Department of Orthodontics, PSM Dental College / KUHS, Kerala, India
[5] Senior Lecturer, Department of Orthodontics, PSM Dental College / KUHS, Kerala, India
[6,7]Post graduate student, Department of Orthodontics, PSM Dental College / KUHS, Kerala, India

---

Abstract:
Background: The primary objective of orthodontic treatment is to improve facial esthetics through changes in soft tissues. In orthodontics the facial harmony is determined by the morphological relationships and proportions of the nose, lip, and chin. The nose being one of the most striking facial features influence the aesthetic outcome of orthodontic therapy. Size, shape, and position of nose determine the aesthetic appearance of face. The nose plays an important role in every aspect of orthodontic treatment like diagnosis, treatment planning and post treatment prognosis.
Objectives: To analyse and quantify pre- and post-orthodontic treatment changes in the nasal dimensions namely nasal tip projection and nasal tip angle following first four premolar extraction.
Materials and Methods: This study was carried out on patients who reported for fixed orthodontic treatment at the orthodontic department of PSM dental college, Thrissur. Pre-treatment and post treatment lateral cephalogram of 91 patients were taken. These patients consisted of Angle's class I malocclusion with mild crowding and undergone first premolar extraction.
Pre-treatment and post treatment measurements of nasal tip projection, and nasal tip angle were analysed. Treatment effects were identified using a conventional cephalometric analysis. Data was analysed using IBM, SPSS Version 26. Student paired T test was used to assess reliability. P value of ≤0.05 was considered statistically significant
Result:The study showed statistically significant increase in both the nasal parameters measured. In nasal tip angle it showed significant increase of 4.978°after treatment and an increment of 3.209 mm in nasal tip projection was observed post orthodontically.
Conclusion: This study concludes that following first premolar extraction there is significant change noted in post treatment nasal tip projection , and nasal tip angle when compared with its pre-treatment dimensions. The results of this study could help the dental practitioner to attain at a possible conclusion like whenever planning for extractions do consider the nasal soft tissue parameters also in diagnosis and treatment planning for a better treatment outcome and satisfaction of patient.
Key Word: Nasal tip projection, nasal tip angle.

I. Introduction

Orthodontics was mainly concerned about correction of skeletal and dental relationship[1]. But nowadays patients are getting more aware about their overall facial appearance along with perfect smile. So, the recent trend has evolved more towards establishing ideal facial aesthetics. Nose and midface are very important for an individual's appearance and facial aesthetics. Nose with its relationship to total face are of great interest to those who deal with facial profile[2] Size, shape and position of nose determine the aesthetic appearance of face. It plays an important role in every aspect of orthodontic treatment like diagnosis, treatment planning and post treatment prognosis[3].

The discussion about extractions in orthodontics started in the early 1900s, when Angle argued in favour of non-extraction treatments. Angle' stressed the significance of soft-tissue changes in orthodontic treatment. He considered the perioral soft tissue an important factor which could change the esthetic appearance of the face. Later, Tweed, Angles disciple decided to retreat some of his patients with extractions and concluded

---

that carefully and consistent planned extractions allowed him to improve patients' appearance as well as treatment stability. In the modern biologic model,variation is the theme, and the task for clinician is to achieve the desired facial and dental outcomes within the ability of the individual to adapt physiologically to the morphologic changes. The desired outcome of an orthodontic treatment includes both functional and esthetic component, both of which are strongly influenced by head and neck soft tissue.

Literature have reported numerous studies on nasal growth ,but its importance as a factor in dentofacial diagnosis and treatment planning has not received much emphasis[4].Numerous investigations have stressed the importance of change in soft-tissue facial profile because of extraction involved orthodontic treatment, but there is a lack of data relating specifically to change in nasal parameters namely nasal tip projection, nasal tip angle.

The purpose of this study is to know whether the orthodontic treatment done in Angle's class I malocclusion cases with mild crowding by doing extraction of four first premolars shows any significant changes to the above said nasal parameters namely nasal tip projection and nasal tip angle ; thereby the relevance of nose in achieving the aesthetic outcome in orthodontic treatment. Cephalometric evaluation was used for the purpose of this study in a group of patients who underwent successful orthodontic treatment at PSM dental college.

II. Material And Methods

The study was started after obtaining a certificate of approval from the Institutional Ethics Committee (PSM College of Dental Sciences and Research, Thrissur). All information obtained from the participants were maintained under strict confidentiality; in addition, an informed consent signed by the participants were obtainedThis study was carried out on patients who reported for fixed orthodontic treatment at the Orthodontic department of PSM dental college, Thrissur. Pre-treatment and post treatment lateral cephalogram of 91patients were taken. These patients consisted of Angle's class I malocclusion treated with first premolar extraction. Pretreatment and post treatment measurements of nasal tip angle and nasal tip projection were analysed to assess changes post orthodontically.

The Inclusion criteria were as follows
- Patients within age group16 years -25 years
- Full complement of permanent teeth irrespective of third molar status.
- Class I malocclusion with minimal crowding
- First premolar extraction
- Healthy periodontium.

The exclusion criteria include
- Previous history of orthodontic treatment, maxillofacial or plastic surgery.
- Individuals having any facial asymmetry
- Craniofacial trauma
- Congenital anomalies
- Mutilated teeth
- Gross skeletal discrepancies
- Systemic diseases including osteoporosis, diabetes mellitus, bleeding disorders, malignancy, etc.

The nasal tip angle is formed by the lines following the general direction of the columella and the nasal bridge.(N-Prn-Sn) .Ideally it ranges between 70-90 degres(Fig 1).

Nasal tip projection is measured by means of a line perpendicular to Frankfort horizontal and running tangent to the vermilion border of the upper lip. This measures the nose from its tip in front of the line and the depth of the incurvation of the upper lip to the line (Fig. 2). According to Holdaway(1983) it ranges between 12mm to 24 mm. Below 12 mm are considered as under projection and above the range of 24 mm is considered as over projection.

On the cephalogram soft tissue and hard tissue outlines were traced on a 0.003 mm matte acetate paper with help of heavy lead pencil of fine tip. Protractor and ruler were used.
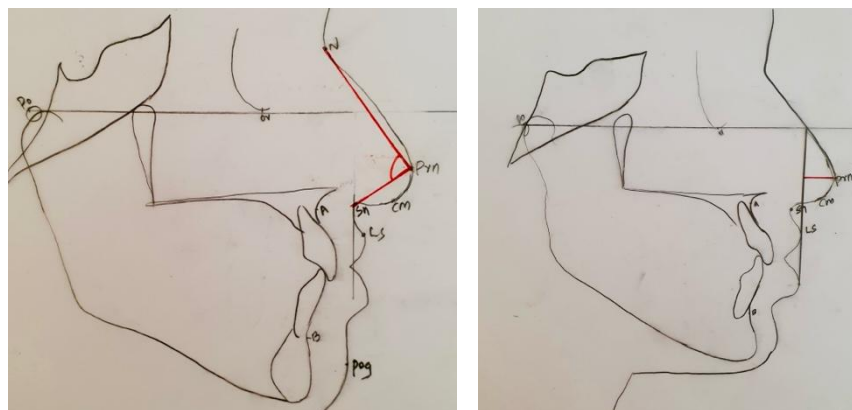
Fig. 1. nasal tip angle Fig.   2. nasal tip projection

Statistical analysis

Statistical analysis was done using IBM, SPSS version 26 statistical software. Descriptive statistics were used to summarize the data. Normality of data was checked using Shapiro wilk test. Statistical comparisons of mean values of Nasal tip projection and Nasal tip angle for changes before and after treatment was done using Paired sample t-test. Theresultsareexpressedasmeanandstandarddeviation.Ap-value≤0.05wasconsideredas statisticallysignificant. The level of significance (p≤0.05) was set at the 95% confidence level. Therefore, any value calculated less than 0.05 was considered significant.

III. Result

The mean pretreatment, posttreatment, and treatment changes along with the standard deviation and student's *t*-test results are shown in (table 1). A significant difference in the pre- and post- orthodontic mean values of nasaltip angle were evident when measured in relation to the cephalometric points.. Mean value of pre-orthodontic nasaltip angle is 90.78° and and post orthodontic value is 95.76 ° .It implies that the nasaltip angle increased significantly by4.978°after fixed orthodontic treatment with four premolar extractions (table2).On analysing the correlation coefficient, it shows a significance of 0.863 (table 4) and the results obtained are statistically significant with p≤0.05.A significant increase in the nasal tip projection compared to their pretreatment values were observed in this study. Nasal tip projection showed a mean value of 12.24 mm in pretreatment phase and after extraction of first premolars and retraction, it increased to a mean value of 15.45 mm (table 3). The student t test showed a significant increase of 3.209 mm in nasal tip projection with a correlation coefficient of 0.776 (table 4).

Time points	Groups*	No. of samples	Mean	Standard Deviation	Std. Error	95%Confidence Interval for Mean	
						Lower Bound	Upper Bound
Pre	NTA	91	90.78	5.050	.529	89.73	91.83
Post		91	95.76	5.160	.541	94.68	96.83
Pre	NTP	91	12.24	1.996	.209	11.83	12.66
Post		91	15.45	2.182	.229	15.00	15.90
*NTA-Nasal tip angle, NTP-Nasal tip projection							

Table-1. Descriptive statistics for facial angles before and after orthodontic treatment

Paired Samples Test								
Comparison Groups*	Paired Differences					t	df	Sig. (2-tailed)
	Mean	SD*	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
PRENTA - POSTNTA	-4.978	2.675	.280	-5.535	-4.421	-17.753	90	.000 Significant
*NTA-Nasal tip angle, **p value based on paired samplest test significant at p≤0.05 *SD standard deviation								

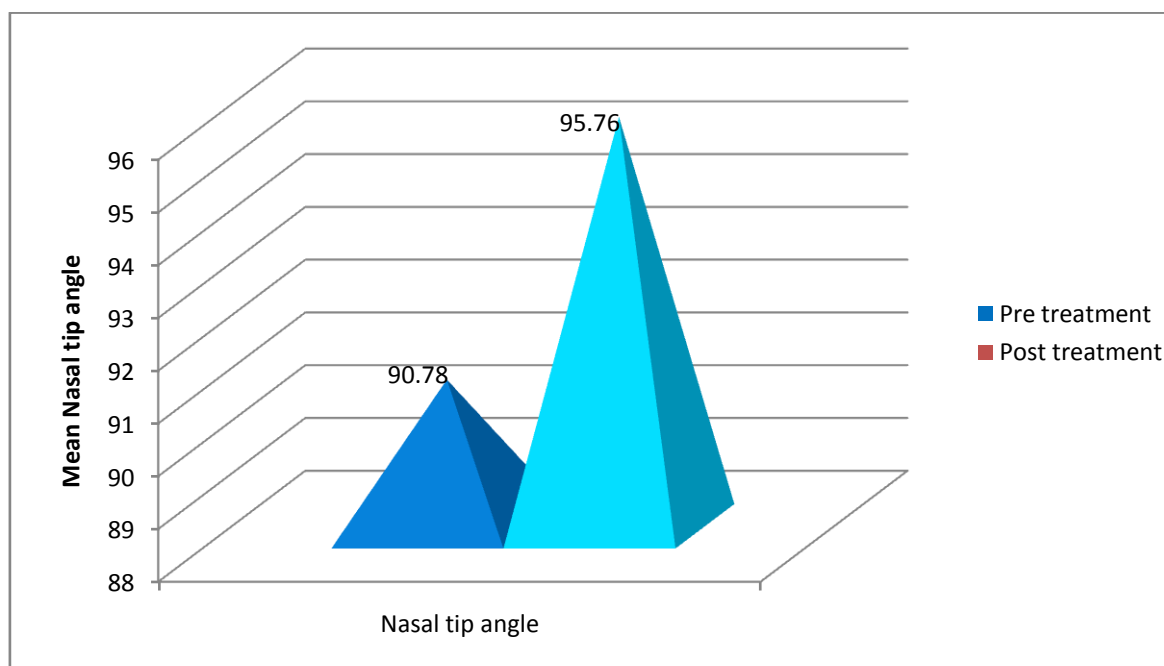Table-2. Comparison of Nasal tip angle before and after orthodontic treatment

Paired Samples Test

| Comparison Groups*	Paired Differences					t	df	Sig. (2-tailed)
	Mean	SD	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
PRENTP - POSTNTP	-3.209	1.410	.148	-3.503	-2.915	-21.703	90	.000 Significant
* NTP-Nasal tip projection, **p value based on paired samplest test significant at p≤0.05								

Table-3. Comparison of Nasal tip projection before and after orthodontic treatment

Paired Samples Correlations

Variable	Time points	N	Correlation	Sig.
Nasal tip angle	Pre and Post	91	.863	.000 Significant
Nasaltip projection	Pre and Post	91	.776	.000 Significant

Table-4 Correlation coefficients for various facial angles before and after orthodontic treatment

Graph-1.Comparison of Nasal tip angle before and after orthodontic treatment
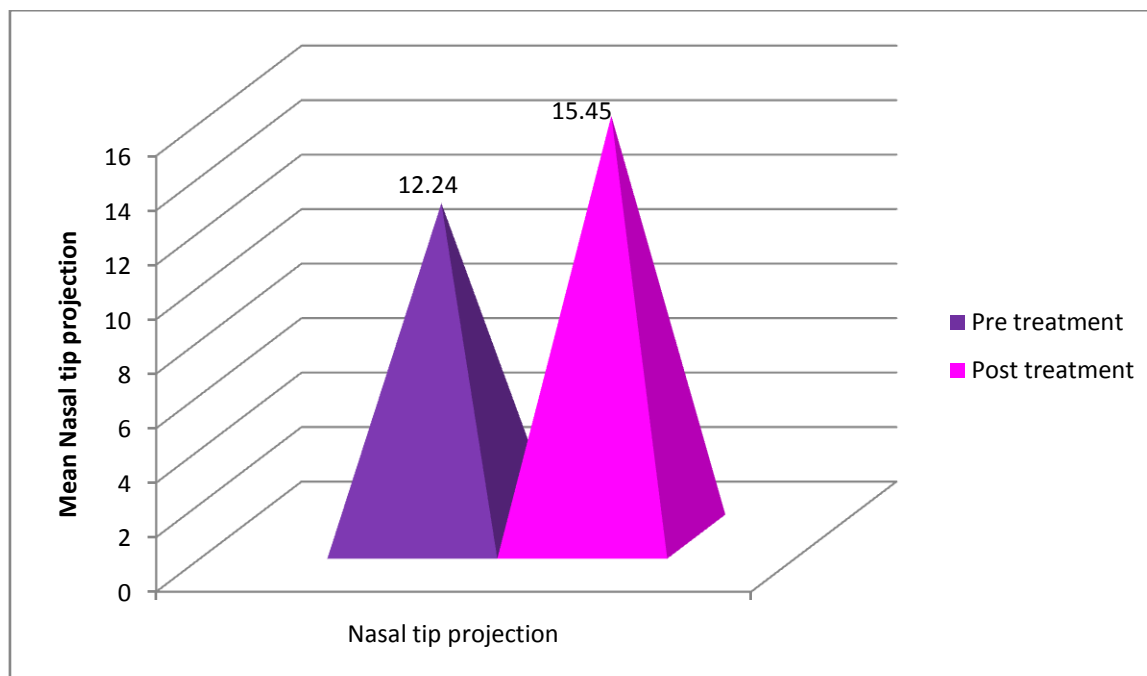
Graph-2. Comparison of Nasal tip projection before and after orthodontic treatment

IV. Discussion

The aim of the routine orthodontic treatment is to improve the facial aesthetics of the patients[15]. Along with dental and skeletal correction, significant soft tissue changes are noticed post orthodontically. The extraction of premolar teeth as part of orthodontic treatment has been the subject of intense debate over the last 100 years. A principal concern regarding premolar extraction is the effect it may have on facial aesthetics, especially soft tissue profile. The nasolabial angle and the distance of the anterior border of the upper and lower lips to the aesthetic plane (E-plane) are commonly used measures of soft tissue profile. Several studies have observed that these two measures increase with orthodontic treatments that include extraction of teeth[6,14] Results of previous studies provide predictive values for the change of nasolabial angle in orthodontic treatment, and a significant component of harmony of the soft-tissue profile is thus under the control of the orthodontist[1]. Increase in the nasolabial angle is significantly correlated with the amount of maxillary incisor retraction in the treatment of Class II, Division 1 malocclusion[1].

This study was carried out to assess whether there is any change in nasal dimension namely nasal tip projection and nasal tip angle when we carry out fixed orthodontic treatment by extraction of four first premolars .The results of this study shows significant change in nasal tip projection following first premolar extraction in class I malocclusion cases. The mean difference in the pre-treatment to post-treatment change in nasal projection was 3.209 °which is statistically significant (P ≤0.05). Similarly the nasal tip angle showed significant increase after orthodontic treatment. The results shows an increase of 4.978 ° in class I cases with mild crowding.

A previous study shows that the amount of retraction achieved in second premolar extraction cases was less than half of the amount of retraction achieved in first premolar extraction cases.[15] This could be an important treatment consideration when deciding on which premolar teeth to extract to maintain facial soft tissue harmony. So whenever planning for extractions do consider the nasal soft tissue parameters also in diagnosis and treatment planning for a better treatment outcome and satisfaction of patient.

V. Conclusion

This study concludes that following first premolar extraction there is significant change noted in post treatment nasal tip projection, and nasal tip angle when compared with its pre-treatment dimensions. The Nasaltip angle increased significantly by 4.978°after fixed orthodontic treatment whereas significant increase of 3.209 mm was noted in nasal tip projection . The result of this study highlights the importance of considering the nasal soft tissue parameters, when the orthodontist diagnoses and device a treatment plan for therapeutic extraction. So, whenever the clinician finds the need of premolar extraction in cases like severe crowding, increased proclination, anteroposterior discrepancies etc, the nasal parameters also should be evaluated along with the routinely analyzed hard and soft tissue parameters. In cases with short nasal parameters, treatment can be proceeded with first premolar extraction itself if it brings about significant improvement in the overall facial

appearance and thereby achieve a better treatment outcome and patient satisfaction. In cases with very prominent nasal tip projection and obtuse nasolabial angle, re-evaluation of treatment plan should be done to get a finer and supreme esthetic outcome.

References

[1].   Lo Franklin D. W. Stuart Hunter .Changes in nasolabial angle related to maxillary incisor retraction. Am journal of orthodontics .1982;82(5):384-391.
[2].   lkenKocadereli. Changes in soft tissue profile after orthodontic treatment with and without extractions. Am J Orthod Dentofacial Orthop .2002;122(1): 67-72.
[3].   Sandra Ani ć -Milo š evi ć , Marina Lapter-VargaandMladen Š analysis of the soft tissue facial profile by means of angular measurements.european journal of orthodontics .2008;30(2):135-40
[4].   Sandeep Shetty, ShafeesKoya ,Shourya Hegde .Rhinion Shift: Change Seen in the Nasal Bone Post Orthodontics: A Cephalometric Study. I J Pre Clin Dent Res 2015;2(6):1-7 .
[5].   Zierhut EC, Joondeph DR, Artun J, Little RM. Long-term profile changes associated with successfully treated extraction and nonextraction Class II Division 1 malocclusions. Angle Orthod2000;70:208–19.
[6].   Looi LK, Mills JR. The effect of two contrasting forms of orthodontic treatment on the facial profile. Am J Orthod Dentofacial Orthop1986;89:507–17.
[7].   Drobocky OB, Smith RJ. Changes in facial profile during orthodontic treatment with extraction of four first premolars. Am J Orthod Dentofacial Orthop1989;95:220–30.
[8].   Young TM, Smith RJ. Effects of orthodontics on the facial profile: a comparison of changes during nonextraction and four premolar extraction treatment. Am J Orthod Dentofacial Orthop1993;103:452–8.
[9].   Bravo LA. Soft tissue facial profile changes after orthodontic treatment with four premolars extracted. Angle Orthod1994;64:31–42.
[10].   Bravo LA, Canut JA, Pascual A, Bravo B. Comparison of the changes in facial profile after orthodontic treatment, with and without extractions. Br J Orthod1997;24:25–34.
[11].   Ismail SF, Moss JP, Hennessy R. Three-dimensional assessment of the effects of extraction and nonextraction orthodontic treatment on the face. Am J Orthod Dentofacial Orthop2002;121:244–56.
[12].   Bowman SJ, Johnston Jr. LE. The esthetic impact of extraction and nonextraction treatments on Caucasian patients. Angle Orthod2000;70:3–10.
[13].   Luppanapornlarp S, Johnston Jr. LE. The effects of premolar-extraction: a long-term comparison of outcomes in "clear-cut" extraction and nonextraction Class II patients. Angle Orthod1993;63:257–72.
[14].   Kirschneck C, Proff P, Reicheneder C, Lippold C. Short-term effects of systematic premolar extraction on lip profile, vertical dimension and cephalometric parameters in borderline patients for extraction therapy. Clin Oral Investig2016;20:865–74
[15].   Konstantonis D, Anthopoulou C, Makou M. Extraction decision and identification of treatment predictors in Class I malocclusions. Prog Orthod2013;14:47.
[16].   Davis RE. Nasal tip complications. Facial Plast Surg. 2012;28(3):294-302.
[17].   Kim SH, Whang E, Choi HG, Shin DH, Uhm KI, Chung H, Song WC, Koh KS. Analysis of the midface, focusing on the nose: an anthropometric study in young Koreans. J Craniofac Surg. 2010;21(6):1941-4.
[18].   Jimoh RO, Alabi SB, Kayode AS, Salihu AM, Ogidi OD. Rhinometry: spectrum of nasal profile among Nigerian Africans. Braz J Otorhinolaryngol. 2011;77(5):589-93.
[19].   Ziad Omara,c , Lesley Shortb , David W. Bantingc , HumamSaltajid,.Profile changes following extraction orthodontic treatment: A comparison of first versus second premolar extraction; International Orthodontics 2017 ; X : 1-14
[20].   Sawh-Martinez R, Lin AM, DeSesa CR, Wu RT, Gary CS, Steinbacher DM. Clockwise and Counterclockwise Le Fort I Movements Influence Nasolabial Morphology Differently. PlastReconstr Surg. 2018 Dec;142(6):1572-1581