The Bioscan AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES 20(2): S2: 464-466, 2025 www.thebioscan.com

# Lip Morphology Changes After First Premolar Extractions in Patients With Bimaxillary Protrusion in Durg Population: A Pilot Study

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**DOI: 10.63001/tbs.2025.v20.i02.S2.pp464-466**

**KEYWORDS**

Orthodontic Dental Patients, Bimaxillary Protrusion, oft tissues, Behaviour Management

**Received on:**

**15-04-2025**

**Accepted on:**

**24-05-2025**

**Published on:**

**27-05-2025**

**ABSTRACT**

Aim: To determine lip morphology changes after first premolar extractions in patients with bimaxillary protrusion as ratios of hard and soft tissue changes.

Materials and Methods: The sample consisted of pretreatment and posttreatment lateral cephalograms of 20 subjects with Class I bimaxillary protrusion who had undergone orthodontic treatment with four first premolars extraction and retraction of upper and lower incisors. Pre and post treatment lateral cephalograms were traced and superimposed by using SN 7° plane. Fourteen linear measurements were made. Statistical analysis was performed to analyse the co relation between the hard and soft tissue change by Pearson's correlation.

Results: Significant changes after treatment were found both in dental and lip analysis. The co-relation of hard tissue to soft tissue were derived.

Conclusion: statistical analysis revealed that a 1 mm retraction of the incisor cervical point would produce a 0.5 mm retraction of lip. The predictability of this study may be helpful for the clinician in predicting the amount of change in profile of the patient post treatment, thus aiding in planning the treatment

## INTRODUCTION

Bimaxillary protrusion is a commonly seen malocclusion in Asian population. It refers to a protrusive dentoalveolar relation of maxillary and mandibular dental arches that produce a convex facial profile and an increased procumbence of lips, making facial esthetics, a primary concern for these patients. Orthodontic treatment not only produces changes in dental component but also indirectly alters the soft-tissue profile of the patient. Therefore, the treatment in bimaxillary protrusion cases is directed toward extraction of upper and lower first premolars with subsequent retraction of upper and lower incisors. As soft tissue follows the hard tissue, quantifying the lip morphology becomes as important as planning the treatment, attributing to the fact that predicting the amount of lip retrusion in patients

with bimaxillary protrusion can be used as a tool for the clinician to anticipate the amount of expected change in the profile of the patient.[1]

**MATERIAL AND METHOD**

The study was designed as a retrospective cross-sectional study. Records of bimaxillary protrusion cases in the Department of Orthodontics and Dentofacial Orthopaedics, maître college of dentistry and research Centre, Anjora, Durg were included in the study.

**Inclusion criteria**

1. Adults (minimum 18 years of age at the start of the treatment)
2. Pretreatment Class I molar relationship, upper and lower incisor protrusion (U1 to NA >4 mm, L1 to NB >4 mm)
3. Cases with orthodontic treatment consisting of the extraction of four premolars with subsequent retraction of anterior teeth
4. Pre- and post-treatment cephalometric radiographs of adequate diagnostic quality.

The present study was conducted as a pilot study for a larger sample study. Twenty cases were identified from the record room. The study was performed on the pre and post treatment cephalograms. All the cephalograms were traced with fine 3H pencil, and each parameter was measured with the same ruler and protractor. Before tracing, all cephalograms were checked to ensure that the radiographs were taken when subjects were relaxed, in maximum intercuspation and lip in repose. All the cephalograms were taken from the same cephalostat (Orthphos XG 3D, Dentsply), under same exposure parameters (77 kV, 15 mA, 9.4 s) and the percentage of magnification for pre- and post-cephalograms were constant. The reference lines for cephalometric analysis were S-true horizontal and S-true vertical. S-true horizontal was constructed from 7 tangent with SN plane and S-true vertical was the line perpendicular with S true horizontal. The variables mentioned in Table 1 were traced to indicate the position of hard and soft tissue landmarks related to the horizontal and the vertical reference lines.

**Table1: Parameters Used for Hard Tissue and Soft Tissue Changes (Fig 1 and 2)**

| Parameters | Definitions |
|---|---|
| H-tU1 (mm) | Distance from upper incisor edge perpendicular to S-true vertical line |
| H-cU1 (mm) | Distance from cervical of upper incisor perpendicular to S-true vertical line |
| H-tL1 (mm) | Distance from lower incisor edge perpendicular to S-true vertical line |
| H-cL1 (mm) | Distance from cervical of lower incisor perpendicular to S-true vertical line |
| V-tU1 (mm) | Distance from upper incisor edge perpendicular to S-true horizontal line |
| V-cU1 (mm) | Distance from cervical of upper incisor perpendicular to S-true horizontal line |
| V-tL1 (mm) | Distance from lower incisor edge perpendicular to S-true horizontal line |
| V-cL1 (mm) | Distance from cervical of lower incisor perpendicular to S-true horizontal line |
| H-U-lip (mm) | Distance from most anterior of upper lip perpendicular to S-true vertical line |
| H-L-lip (mm) | Distance from most anterior of lower lip perpendicular to S-true vertical line |
| V-U-lip (mm) | Distance from most inferior of upper lip perpendicular to S-true horizontal line |
| V-L-lip (mm) | Distance from most superior of lower lip perpendicular to S-true horizontal line |
| H-subnasale (mm) | Distance from subnasale perpendicular to S-true vertical line |
| H-sulcus superioris (mm) | Distance from sulcus superioris perpendicular to S-true vertical line |

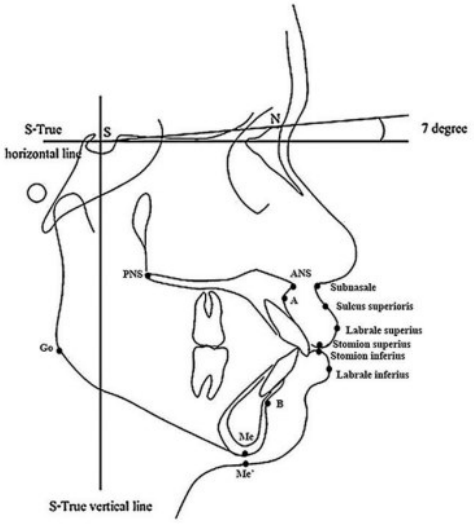


Fig1: reference point of study

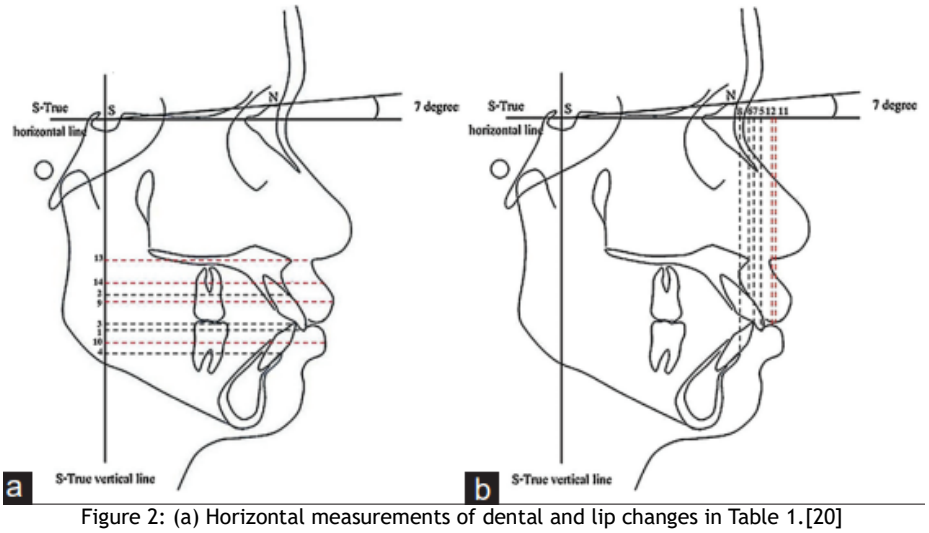


Figure 2: (a) Horizontal measurements of dental and lip changes in Table 1.[20]
(b) Vertical measurements of dental and lip changes in Table 1

**Data Analysis:** The data were evaluated for statistical significance and P < 0.05 was considered as the level of significance. Mean comparison of each parameter were calculated (table2-15). Pearson's correlation coefficients were calculated to assess the association between the hard and soft tissue measurements

**Ethical Considerations:** Ethical approval for the study was obtained, and informed consent was secured from the parents or guardians of all participants prior to their inclusion in the study.

**Result:** Table 2 shows the correlations between the changes in the soft tissue with the hard tissue and with the pretreatment soft-tissue variables in the horizontal and vertical planes. Horizontal lip changes Pearson's correlation showed significant positive correlations between the horizontal changes in upper lip position and the horizontal changes of maxillary incisor cervical position, horizontal changes of mandibular incisor cervical position (R = 0.5). There were significant positive correlations between the horizontal changes of lower lip position and those of maxillary incisor tip position , maxillary incisor cervical position (R = 0.89), mandibular incisor tip position (R = 0.5). The changes of upper and lower lips correlated with the changes of upper and lower incisors mainly occurred in the sagittal direction.

**Table 2: Correlation Matrix of Hard and Soft Tissue**

| Group | r-value | Inference | p-value |
|---|---|---|---|
| Hard tissue values | 0.5 | moderate correlation | 0.001 (H.S.) |
| Soft tissue value | | | |

**Statistical test: Pearson's Correlation; (p<0.05- significant, CI=95%), N= number of study subjects H.S.- Highly Significant**

## DISCUSSION

The present study focused on the effects of the dental changes on the soft-tissue profile variables. The ratio of the amount of retraction of the incisors to lip retrusion is a key factor for the prediction of the soft-tissue profile following orthodontic treatment. This ratio has been evaluated in subjects with different morphological, gender, and racial backgrounds using various reference points on the lateral cephalograms. In our study, the ratios of incisor retractions and upper and lower lip retractions came out to be 1:0.59 and 1:0.89, respectively. These ratios are in concordance with previous studies made by Suntornlohanakul et al.[2], Diels et al[3] and Caplan and Shivapuja[4]. Another study from Kusnoto and Kusnoto[5] in Indonesians presented the ratios of incisor retractions and upper and lower lip retractions as 1:0.4 and 1:0.6, respectively. This study was also done in subjects with bimaxillary skeletal prognathism. These ratios are slightly lesser than the ratios obtained in our present study. This can be attributed to ethnic differences. Several studies in the past have discussed the ratios for Caucasians. The ratios of maxillary incisor retraction to upper lip retraction ranged from 2.24:1 to 2.93:1 and for mandibular incisor retraction to lower lip retraction from 1.11:1 to 1.23:1[6,7,8]. The ratio of mandibular incisor retraction to lower lip retraction (1:0.89) from our study stands close to this range, however, the ratio of maxillary incisor retraction to upper lip retraction is slightly more in our study. This may be attributed to the fact that our sample consisted of more subjects with thin lips. The changes of upper and lower lips correlated with the changes of upper and lower incisors mainly occurred in the sagittal direction.

## CONCLUSION

There were significant changes of upper and lower lips as related to upper and lower incisor retractions.

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