

Evaluation Of Beta Angle Before And After Orthodontic Treatment In Skeletal Class II Malocclusion Patients In Chengalpattu District

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ABSTRACT

Background and Objective: In orthodontic diagnosis and treatment planning, evaluate and compare the Beta angle before and after orthodontic treatment in skeletal Class II malocclusion patients in Chengalpattu district using lateral cephalograms, with emphasis on its reliability in assessing sagittal skeletal discrepancy.

Materials and methods: A retrospective study was conducted using lateral cephalometric radiographs obtained from the Department of Orthodontics, Karpaga Vinayaga Institute of Dental Sciences, Chengalpattu District, Tamil Nadu. This included 40 cephalograms from 20 patients with skeletal Class II malocclusion, comprising pretreatment and post-treatment radiographs. Patients treated between 2022 and 2025, aged 12–30 years were included.

Results: The mean beta angle before orthodontic treatment was $24.07 \pm 1.80^\circ$, whereas the corresponding post-treatment mean was $29.60 \pm 2.854^\circ$. This reflects a mean increase of 5.53° following treatment in patients with skeletal class II malocclusion.

Conclusion: Orthodontic treatment produced a highly significant improvement in the Beta angle among patients with skeletal Class II malocclusion, increasing from $24.07 \pm 1.80^\circ$ pretreatment to $29.60 \pm 2.854^\circ$ post-treatment ($p < 0.0001$). The Beta angle may therefore serve as a useful cephalometric parameter for assessing sagittal skeletal changes following orthodontic treatment.

Keywords: Beta angle, skeletal class II malocclusion, sagittal discrepancy, lateral cephalogram, pre-treatment, post-treatment

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INTRODUCTION

Skeletal malocclusion involves an abnormal relationship between the maxilla and mandible in the anteroposterior, transverse, or vertical dimensions. Among these, sagittal discrepancies are important in orthodontic diagnosis and treatment planning. Skeletal Class II malocclusion is characterized by an abnormal sagittal relationship between the maxilla and mandible, commonly associated with mandibular retrusion, maxillary protrusion, or a combination of both.

Lateral cephalometry is routinely used to assess sagittal skeletal relationships. Although ANB angle and Wits appraisal are commonly used, their measurements may be affected by factors such as cranial base morphology,

mandibular rotation, and occlusal plane orientation. These limitations have encouraged the use of alternative skeletal measurements.

Baik and Ververidou introduced the Beta angle in 2004 to evaluate the sagittal relationship between the maxilla and mandible. It is constructed using the points A, B, and C, with Point C representing the apparent axis of the condyle. Unlike conventional measurements, the Beta angle is primarily based on maxillary and mandibular landmarks and is less dependent on cranial base and occlusal plane relationships [5].

Indian studies have demonstrated population-specific differences in Beta-angle values, emphasizing the need for appropriate interpretation within individual populations.

However, limited studies have evaluated changes in Beta angle in the same skeletal Class II patients before and after orthodontic treatment. Therefore, assessing pre-treatment and post-treatment Beta-angle values may provide useful information regarding changes in sagittal skeletal relationships following orthodontic treatment

AIM

To evaluate the changes in Beta angle before and after orthodontic treatment among patients with skeletal Class II malocclusion in Chengalpattu district using lateral cephalometric radiographs.

MATERIALS AND METHODS

This retrospective study was conducted using lateral cephalometric radiographs obtained from the Department of Orthodontics, Karpaga Vinayaga Institute of Dental sciences, Chengalpattu district, Tamil Nadu. The study included 40 lateral cephalograms of patients with skeletal class II malocclusion and this comprised of 20 pre-treatment and 20 post-treatment cephalograms, 12 belonged to female patients and 8 to male patients.

The study sample was selected according to predefined inclusion and exclusion criteria. Patients treated between 2022 and 2025, aged 12–30 years, with an ANB angle greater than 5° were included. Records of patients with craniofacial syndromes, cleft lip and/or palate, other congenital craniofacial deformities, or a history of previous orthodontic or orthognathic treatment were excluded from the study.

Following the sample selection, all lateral cephalograms were manually traced, and the beta angle was measured and tabulated for each radiograph. The cephalometric tracings were performed on 0.004-inch matte acetate tracing sheets using a 0.5-mm 2HB lead pencil. To evaluate intra-examiner reliability, ten cephalograms were randomly selected and retraced after a suitable interval. The measurement error was assessed and found to be statistically insignificant.

The beta angle is a cephalometric parameter used to assess the sagittal skeletal relationship between the maxilla and the

OBJECTIVES

1. measure the pre-treatment beta angle in patients with skeletal class II malocclusion in Chengalpattu district.
2. To measure the post-treatment beta angle in the same patients following completion of orthodontic treatment in Chengalpattu district.
3. To compare the pre-treatment and post-treatment beta angle values
4. Assess the changes in sagittal skeletal jaw relationship following orthodontic treatment in skeletal class II malocclusion patients.

mandible. It is formed by the angle between the A–B line and a line drawn from point A (Subspinale) perpendicular to the line joining point C (apparent axis of condyle) and point B (Supramentale). According to the original description of the beta angle, values less than 27° are indicative of a skeletal Class II relationship, whereas values between 27° and 35° represent a normal skeletal relationship. [5].

All cephalometric tracings and measurements were carried out using a standardized protocol to ensure consistency and reliability throughout the study.

STATISTICAL ANALYSIS

The data were compiled in Microsoft Excel and statistical analysis was carried out using IBM Statistical Package for the Social Sciences (SPSS) version 21.0. Since the beta angle measurements before and after treatment were obtained from the same individuals, a paired t-test was applied to determine the significance of the difference between the two time points. The mean difference was reported with its corresponding 95% confidence interval (CI).

A p-value of 0.05 or less was considered as statistically significant.

RESULTS

Table 1: Comparison of Pre-Treatment and Post-Treatment Beta Angle Values

Group	Mean ± SD	95% Confidence Interval		t value	p value
		Lower	Upper		
Pre treatment	24.07±1.80	-6.3282	-4.3282	9.663	<0.0001
Post treatment	29.60±2.854				

The average beta angle before orthodontic treatment was 24.07 ± 1.80°, whereas the corresponding post-treatment mean was 29.60 ± 2.854°. This reflects a mean increase of 5.53° following treatment. The CI for the mean difference

ranged from -6.3282 to -4.3282. Statistical evaluation using the paired t-test yielded a t-value of 9.663 with a p-value of <0.0001, demonstrating a highly significant improvement in the beta angle after orthodontic treatment.

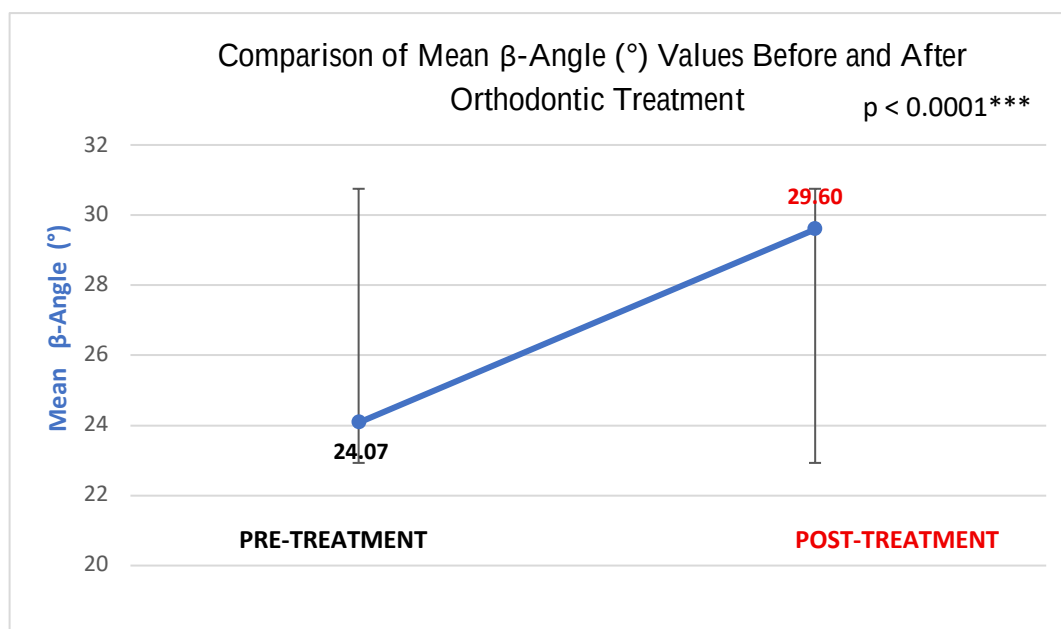


Figure1: Comparison of mean β -angle (°) values before and after orthodontic treatment in Chengalpattu district population. Error bars represent standard deviation (SD). *** indicates a highly statistically significant difference ($p < 0.0001$).

DISCUSSION

The present study evaluated the changes in the Beta angle following orthodontic treatment in patients with skeletal Class II malocclusion. The comparison of pre-treatment and post-treatment cephalometric measurements showed an increase in the mean Beta angle from 24.07° to 29.60° . This improvement indicates a favourable change in the sagittal skeletal relationship after treatment.

The Beta angle is considered a valuable cephalometric measurement because it assesses the anteroposterior relationship of the maxilla and mandible with minimal influence from cranial base landmarks. As a result, it provides a dependable assessment of skeletal discrepancy and can be used throughout diagnosis, treatment planning, and post-treatment evaluation. In the present study, the increase in Beta angle values following treatment suggests that the skeletal relationship improved toward a more balanced Class I pattern.

The statistical analysis demonstrated that the difference between the pre-treatment and post-treatment Beta angle values was significant. This finding confirms that the treatment produced measurable skeletal changes rather than random variations. Although patients may have undergone different treatment approaches, the overall improvement in the Beta angle reflects the effectiveness of orthodontic treatment in correcting sagittal skeletal discrepancies associated with Class II malocclusion.

The mean beta angle was $31.43 \pm 4.34^\circ$ for Class I, $23.85 \pm 3.55^\circ$ for Class II, and $39.00 \pm 3.86^\circ$ for Class III. These findings were comparable with Baik et al. Values $< 27^\circ$

suggested Class II, while $> 35^\circ$ indicated Class III, consistent with findings reported by Singh et al. This supports the reliability of beta angle in assessing sagittal skeletal relationships across populations [2].

Ghosh et al. observed clear differences in beta angle among the three skeletal patterns, indicating its usefulness in identifying anteroposterior skeletal discrepancies. Their findings also supported the reliability of beta angle as a cephalometric parameter for sagittal assessment [3].

Maruthi et al. reported significant differences in beta angle among skeletal Class I, II, and III groups in the Chennai population, supporting its reliability in assessing sagittal skeletal relationships across different populations [6].

Nandakishor Mude et al. reported that beta angle effectively assessed sagittal skeletal discrepancies and showed comparable diagnostic value to ANB and Wits appraisal. This supports the present study, in which beta angle was used to evaluate sagittal skeletal relationships before and after orthodontic treatment in skeletal Class II patients [7].

CONCLUSION

The beta angle showed a highly significant increase following orthodontic treatment in patients with skeletal Class II malocclusion. The mean beta angle increased from $24.07 \pm 1.80^\circ$ pretreatment to $29.60 \pm 2.854^\circ$ post-treatment, with a mean increase of 5.53° . This improvement indicates a favourable change in the sagittal skeletal relationship.

Although the findings support the clinical usefulness of the Beta angle in evaluating treatment changes, certain limitations should be acknowledged. In addition, the sample size and retrospective nature of the study may limit the generalization of the results. Larger samples, prospective study designs, and comparisons among different treatment modalities would help strengthen the evidence regarding the clinical application of the Beta angle.

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