



“COMPARATIVE EVALUATION OF MACROESTHETIC OUTCOMES ACHIEVED BY REMOVABLE VERSUS FIXED TWIN BLOCK APPLIANCE: A CEPHALOMETRIC ANALYSIS”

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ABSTRACT

Aim: This study aimed to evaluate and compare the macroesthetic outcomes of removable versus fixed Twin Block appliances in growing patients with skeletal Class II malocclusion. **Methods:** A randomized controlled trial was conducted on 40 patients aged 8–15 years with Angle's Class II division 1 malocclusion and positive visual treatment objectives. Subjects were equally divided into two groups: Group A (removable Twin Block) and Group B (fixed Twin Block). Pre- and post-treatment lateral cephalograms were obtained, manually traced, and analyzed for soft tissue parameters, including the nasolabial angle and lip position relative to the E-line. Data were subjected to statistical analysis with a significance level of $p < 0.05$. **Results:** Both groups demonstrated favorable soft tissue profile changes following functional appliance therapy. The nasolabial angle showed greater improvement in the removable group (mean change 5.85°), though this did not reach statistical significance ($p = 0.06$). The upper lip position relative to the E-line demonstrated a statistically significant difference between groups, with the removable Twin Block producing greater retrusion ($p = 0.02$). No significant intergroup difference was observed in the lower lip position ($p = 0.83$). **Conclusions:** Removable and fixed Twin Block appliances are both effective in improving facial esthetics in growing Class II patients. However, removable Twin Blocks demonstrated marginally superior outcomes in enhancing upper lip position and nasolabial angle, suggesting greater potential for soft tissue profile refinement. Appliance selection should be guided by individual treatment objectives, growth potential, and compliance considerations.

KEYWORDS : Macroesthetics, Twin Block, removable appliance, fixed appliance, skeletal Class II malocclusion, facial esthetics.

Facial esthetics play a pivotal role in an individual's self-perception and psychological well-being. Among various components contributing to facial attractiveness, macroesthetic harmony-encompassing the proportional relationships between skeletal, dental, and soft tissue structures-holds significant importance.

A harmonious facial profile is often associated with beauty, thereby influencing how others view individuals and how they perceive themselves [1, 2]. Historically, Angle's philosophy emphasized achieving facial harmony based on classical ideals, believing that a “full complement of teeth” was essential for perfect balance and esthetics. This non-extraction approach dominated early orthodontics. However, this approach faced criticism from several experts, including Dr. Calvin Case and Tweed, who questioned its validity. They observed that non-extraction protocols led to poor stability and suboptimal esthetic outcomes. They advocated extractions to achieve better dental alignment and facial harmony [2, 3].

Numerous studies confirm that disharmonious facial features can negatively influence social perception, trigger bullying, and even limit career opportunities [4, 5]. For many individuals, the primary motivation is the enhancement of facial appearance. Consequently, one of the objectives of orthodontics is to establish a balanced, pleasing facial profile, rather than strictly conforming to normative skeletal and dental ideals [6, 7].

A comprehensive evaluation of dentofacial esthetics requires both static and dynamic assessments of the face. Clinically, this includes analyzing facial symmetry, the relationship between teeth and lips, and the influence of skeletal and dental structures on soft tissue drape [3]. Ackerman et al. introduced a hierarchical approach to esthetic diagnosis, classifying facial and dental esthetics into three primary domains:

- **Macroesthetics:** Concerned with facial proportions in all three

dimensions

- **Miniesthetics:** Focuses on the relationship between the dentition and soft tissues, especially during smiling and speech.
- **Microesthetics:** Involves the finer details of individual teeth [8, 9].

The subjective nature of beauty complicates its measurement. Studies have shown that both dental professionals and laypersons vary in their perceptions of facial attractiveness [10]. Nonetheless, patient satisfaction with their facial and dental appearance remains a critical predictor of their expectations and perceived success of orthodontic treatment [11].

Functional appliances are commonly employed in growing patients with skeletal Class II malocclusion, particularly those with mandibular retrusion. Twin Block appliances are designed to advance the mandible and modulate craniofacial growth, resulting in both skeletal and soft tissue adaptations. Available in removable and fixed configurations, they are recognized for their clinical effectiveness, patient compliance, and distinct therapeutic advantages. [12, 13].

While earlier studies questioned the extent to which functional appliances enhanced facial attractiveness [14], more recent research indicates that both removable and fixed functional appliances can significantly improve the facial profile [15]. However, no conclusive evidence exists directly comparing the esthetic outcomes between removable and fixed Twin Block appliances, highlighting a gap in the literature.

In light of the growing importance of esthetics in treatment planning and patient satisfaction, this study aims to compare the macroesthetic outcomes in patients with skeletal Class II malocclusion treated with removable versus fixed Twin Block appliances. Using cephalometric analysis, this research intends to evaluate the relative improvement in facial harmony and profile balance offered by these two modalities.

AIM:

The purpose of this study is to evaluate the macroesthetics after removable versus fixed twin block appliance treatment

OBJECTIVE:

To evaluate macroesthetics after removable versus fixed twin block appliance therapy

MATERIALS AND METHODOLOGY:

Patients with skeletal class II malocclusion aged between 8-15 years reporting to the Department of Orthodontics were selected for this study. A total of 40 subjects who fulfilled the inclusion criteria were taken under the study and divided equally and randomly into 2 groups. Group A was treated with a removable twin block appliance, and Group B was treated with a fixed twin block appliance. The study involved a simple randomized sampling technique. Pre- and post-phase-1 lateral cephalograms were taken and traced manually. The observations after the completion of the study were subjected to statistical analysis, and objective conclusions from the acquired results were drawn. The study was conducted abiding by all human ethical principles as per the Declaration of Helsinki and guidelines of the Occupational Safety and Health Administration [OSHA].

Sample size and source:**Formula used:**

$$n = \frac{(\sigma_1^2 + \sigma_2^2 / \kappa) (Z_{1-\alpha/2} + Z_{1-\beta/2})^2}{\Delta^2}$$

The notation for the formula is:

n= sample size of per group

σ_1 = standard deviation of Group 1

σ_2 = standard deviation of Group 2

= difference in group means

= ratio = 1

$Z_{1-\alpha/2}$ = two-sided Z value (eg. Z=1.96 for 95% confidence interval).

$Z_{1-\beta/2}$ = power

Methods Of Selection Of Study Subjects:**Inclusion Criteria-**

- 1) Individuals with Angle's class II division 1 malocclusion
- 2) Individuals with an overjet greater than 5 mm
- 3) Individuals with positive VTO (Visual Treatment Objective)
- 4) Individuals in CVMI stage 3-5

Exclusion Criteria-

- 1) Individuals with Angle's class I malocclusion
- 2) Individuals with an overjet of less than 5 mm
- 3) Individuals with negative VTO (Visual Treatment Objective)
- 4) Individuals with craniofacial anomalies

RESULT**Group A Vs Group B****Soft Tissue Changes**

The nasolabial angle and the lower lip position relative to the E line did not show a statistically significant difference. The upper lip position relative to the E-line demonstrated a significant difference

Measurement	POST group A	POST group B	Difference	P value
Nasolabial angle	100.25	94.4	5.85	0.06
E upper	1.6	2.5	-0.9	0.02
E lower	1.9	1.8	0.1	0.83

**DISCUSSION**

Facial esthetics has emerged as a cornerstone of orthodontic diagnosis and treatment planning, particularly in growing patients. With increasing emphasis on patient-centered care, the esthetic outcomes are now critically evaluated as functional and occlusal corrections. Among malocclusion patterns, skeletal Class II discrepancies — most often characterized by mandibular retrognathism — are not only prevalent but also prominently affect a patient's facial harmony and social self-perception. The Twin Block appliance has become one of the most popular functional appliances. Both removable and fixed variants of the Twin Block are used today, with varying indications based on patient cooperation and growth stage.

Despite the widespread use of both types of Twin Block appliances, there exists limited evidence comparing their outcomes in a controlled setting. Therefore, there was a need to conduct a well-structured study that could provide clear and comprehensive data on the effectiveness of Removable versus Fixed Twin Block appliances.

Previous studies have reported significant esthetic enhancements with these appliances:

- Toth and McNamara (1999) compared Twin Block and Frankel appliances and reported significant improvements in soft tissue convexity, upper lip retrusion, and increased chin prominence with the Twin Block, indicating improved facial profile.
- Baysal and Uysal (2013) examined the soft tissue effects of the Twin Block and Herbst appliance and found that both led to a significant increase in nasolabial angle and reduction in upper lip protrusion, with a slightly more pronounced effect in the removable Twin Block group.
- Illing et al. (1998) reported that both removable and fixed functional appliances improve soft tissue facial profile, but individual variability and appliance design elements, such as expansion screws and lip pads, can influence the degree of esthetic change.

In the present study, both the removable (Group A) and fixed (Group B) Twin Block appliances yielded notable improvements in the soft tissue profile

1. Nasolabial Angle:

o The intergroup difference was not statistically significant ($p = 0.06$), the greater improvement in the removable group aligns with the previous findings, which reported more pronounced soft tissue changes with the removable design.

2. Upper Lip Position (to E-line):

o These results are consistent with the Toth and McNamara study, which emphasized the favorable upper lip positioning obtained using Twin Blocks compared to other appliances.

3. Lower Lip Position (to E-line):

o This finding aligns with the results of Illing et al., who noted that lower lip response is generally less variable across different functional appliances, likely due to its closer anatomical connection with the chin and mandible.

This subtle, but clinically relevant distinction emphasizes the importance of appliance selection based on individual treatment objectives. When facial esthetics and soft tissue profile refinement are key treatment priorities, the removable Twin Block may offer marginally better outcomes due to its skeletally driven mode of action, as opposed to the more dentally compensatory nature of fixed variants. These findings suggest removable Twin Block appliances may offer superior control over upper lip position and nasolabial angle-possibly due to better adjustability and incorporation of components like labial bows and selective acrylic trimming.

SUMMARY AND CONCLUSION

The comparative effects of fixed versus removable Twin Block appliances on soft tissue parameters remain a subject of ongoing investigation. Several previous studies have shown varying outcomes. Therefore, a study was conducted to compare the soft tissue effects of removable versus fixed Twin Block appliances in growing patients with skeletal Class II malocclusion

The study findings revealed that,

- a) Removable twin block showed greater improvement in soft tissue profile, particularly upper lip retrusion and nasolabial angle increase,

indicating better hard-tissue-to-soft-tissue harmony may be due to less dental compensation.

Ultimately, appliance selection should be individualized, considering Growth potential, patient compliance, treatment objectives, and the desired balance between skeletal and dental effects.

LIMITATIONS AND FUTURE SCOPE

- The sample size, while statistically adequate, limits the generalizability of the findings.
- Soft tissue volumetric alterations were not assessed.
- Long-term stability was not evaluated.

Future studies incorporating 3D facial scans and photogrammetry would enrich our understanding. Additionally, patient-reported outcome measures (PROMs) should be integrated to bridge the gap between clinical findings and patient satisfaction.

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