

## Correction of Class III Malocclusion with Klammt's Elastic Open Activator: A Case Report

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**Abstract: Introduction:** Class III malocclusion has a multifactorial etiology, resulting from interactions among innate, genetic, and environmental factors. It is generally characterized by a concave facial profile, anterior crossbite, increased effective mandibular length, and, in combined cases, midface deficiency due to maxillary retrusion. **Objective:** This case report aims to review the biological basis and characteristics of Class III malocclusion in the mixed dentition, as well as its early functional orthopedic management. **Case Report:** An 8-year-old girl with anterior crossbite and skeletal Class III malocclusion was treated with the Klammt Class III elastic open activator, resulting in correction of the anterior crossbite and a favorable change in her facial profile. **Conclusion:** The Klammt Class III elastic open activator produces favorable outcomes in anterior crossbite correction, enhances facial profile and posture, and redirects maxillary and mandibular growth during the mixed dentition stage.

**Key words:** Dentition Mixed, Malocclusion, Preventive Orthodontics, Pediatric Dentistry.

## Corrección de la Maloclusión de Clase III con el Activador Elástico Abierto de Klammt: Reporte de un Caso

**Resumen: Introducción:** La maloclusión clase III tiene una etiología multifactorial, es el resultado de la relación entre los factores innatos, genéticos y factores ambientales. Caracterizada generalmente por un perfil facial cóncavo, mordida cruzada anterior, aumento de longitud efectiva mandibular y en casos combinados por deficiencia del tercio medio facial, asociado a retrusión maxilar. **Objetivo:** El objetivo de este reporte de caso es revisar los fundamentos biológicos y características de la maloclusión clase III en dentición mixta, así como el manejo ortopédico funcional temprano. **Reporte de caso:** Se presenta el caso de una niña de 8 años con mordida cruzada anterior y clase III esquelética tratada con un Activador Abierto Elástico de Klammt clase III, logrando la corrección de la mordida cruzada anterior y una mejora favorable en el perfil facial. **Conclusión:** El activador abierto elástico de Klammt III genera cambios favorables en la oclusión cruzada anterior, mejora el perfil facial, postural y contribuye a redireccionar el crecimiento del maxilar y mandibular en dentición mixta.

**Palabras clave:** Dentición Mixta, Maloclusión, Ortodoncia Preventiva, Odontología Pediátrica.

## Correção da Má Oclusão de Classe III com o Ativador Elástico Aberto de Klammt: Relato de Caso

**Resumo: Introdução:** A maloclusão Classe III possui etiologia multifatorial, resultante da interação entre fatores inatos, genéticos e ambientais. Caracteriza-se geralmente por perfil facial côncavo, mordida cruzada anterior, aumento do comprimento mandibular efetivo e, em casos combinados, por deficiência do terço médio facial associada à retrusão maxilar. **Objetivo:** Este relato de caso visa revisar os fundamentos biológicos e as características da maloclusão Classe III na dentição mista, bem como seu manejo ortopédico-funcional precoce. **Relato de caso:** Apresenta-se o caso de uma menina de 8 anos com mordida cruzada anterior e maloclusão esquelética Classe III, tratada com ativador elástico aberto de Klammt Classe III. O tratamento resultou na correção da mordida cruzada anterior e na melhora favorável do perfil facial. **Conclusão:** O ativador elástico aberto de Klammt Classe III promove mudanças favoráveis na correção da mordida cruzada anterior, melhora o perfil facial e postural, e contribui para redirecionar o crescimento maxilar e mandibular durante a dentição mista.

**Palavras-chave:** Dentição Mista, Má Oclusão, Ortodontia Preventiva, Odontopediatria.

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## Introduction

The etiology of Class III malocclusion is multifactorial, resulting from the relationship between innate or hereditary and genetic factors with environmental factors<sup>1</sup>. Environmental factors affecting this malocclusion include those associated with postural abnormalities<sup>2</sup>, habits, atypical swallowing, nasal obstruction, and oral breathing<sup>3</sup>. Early diagnosis of Class III malocclusion is essential, considering a sequence of facial, cephalometric, and occlusal characteristics<sup>4</sup>.

Mandibular prognathism is a common facial disorder, with a prevalence of 8% to 40% in Asian populations, 3% to 8% in Africa, and 0.48% to 4% in Europe<sup>5</sup>. Head posture is related to changes in skeletal facial growth patterns<sup>6</sup>. Stretching of the cervical muscles generates an increase in cervical lordosis<sup>7</sup>.

The skeletal sagittal and airway diagnosis is made using linear and angular cephalometric measurements, such as Bimler's osseous overjet, Witts plane, McNamara linear measurements, and Steiner's ANB<sup>8</sup>. Currently, cone-beam computed tomography (CBCT) allows for a more comprehensive evaluation<sup>9</sup>.

The prognosis of treatment improves when Class III malocclusion is due to sagittal maxillary deficiency, with the focus aimed at redirecting growth<sup>10</sup>. The objective of this case report was to review the biological foundations and characteristics of Class III malocclusion in its early stages and to present the osseous, dental, and soft tissue changes in a patient with skeletal Class III, treated with the Klammt Class III open elastic activator.

## Case History

The patient is an 8-year-old female referred to the Orthodontics and Maxillary Orthopedics Clinic at UNICOC Cali School of Dentistry. She presented with anterior crossbite, inverted smile line, increased lower facial third, mixed dentition, and Class III molar relationship<sup>11</sup> (Figures 1 and 2).

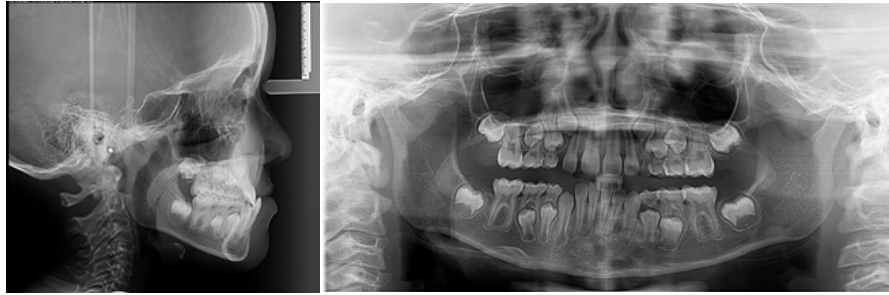


Figure 1. Extraoral photographs pretreatment.



Figure 2. Intraoral photographs pretreatment.

Cephalometric measurements confirm the diagnosis of Class III with sagittal maxillary deficiency (Figure 3).



**Figure 3.** Pretreatment radiographs.

A' B' -1.86 mm, SNA 77.08°, SNB 78.05°, ANB -0.97°, Witts -5.23 mm. Facial axis 90.5°, brachyfacial biotype 44.8°, U1 to Fh 107.52°, IMPA 92.81°, FMA 23.69°, APDI 87.32° Class III. Upper airway 11 mm and lower airway 12 mm, within the norm for the patient's age<sup>12</sup>.

The objective of our orthopedic treatment was to correct the anterior crossbite, stimulate transverse and sagittal maxillary growth, redirect mandibular growth, reposition the tongue, and improve cervical posture.

### Treatment Progress

The decision was made to use the Klammt Class III open elastic activator, with an ideal daily wear time of 14 hours and a minimum of 8 hours to achieve a favorable orthopedic effect over at least five months<sup>13</sup>.

The open elastic activator, designed by George Klammt in Germany<sup>14</sup>, is a simple,

comfortable, bimaxillary appliance that is minimally invasive in the oral functional space, allowing it to be worn both day and night, even by children with oral breathing. Due to its design, it allows the tongue to act as a growth-driving force<sup>1</sup>.

A constructive bite was made to achieve a therapeutic postural change to generate disocclusion and correct the crossbite. The registration was made in 4-sheet thick base wax in an M shape to align the midline properly and increase vertical dimension to allow for anterior bite correction.

This appliance consists of two acrylic parts, a palatal arch, vestibular arches (upper and lower), and incisal guides (in this case, upper, to retrain tongue posture and guide the correct positioning of the incisors)<sup>1</sup>. (Figure 4).

The acrylic parts serve to secure the wires, maintain the mandible in its new position, and the wire systems help restore functions<sup>1</sup> (Figure 5).



**Figure 4.** KOEA class III.



Figure 5. KOEA class III.

### Treatment Results

After 4 weeks of using the activator, a therapeutic postural change was observed<sup>15</sup> associated with a new neuromuscular engram (Figure 6).

With continuous use of the activator and following usage recommendations, the

anterior crossbite was corrected, upper incisor inclination improved, lower facial height increased, and a favorable change in facial profile was achieved. Skeletally, increased osseous overjet, increased ANB, improved sagittal mandibular positioning, and clockwise rotation of the mandibular plane were observed. Cephalometric measurements after 6 months of functional maxillary orthopedics show correction of dental and osseous overjet +2.54 mm, SNA increased by 1.06°, SNB decreased by 0.73°, ANB increased by 1.79°, Witts improved by 4.4 mm, U1 to Fh increased by 8.61°, IMPA decreased by 4.21°, facial pattern became normodivergent FMA 25.63°, APDI changed to Class I 82.52°. Upper and lower airway increased by 3 mm each (Figure 7), (Table 1).



Figure 6. Treatment progress.

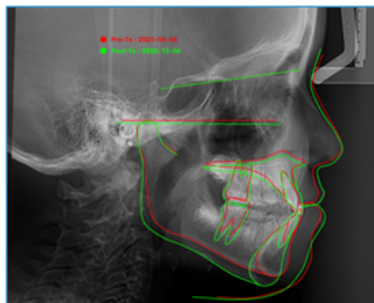


Figure 7. Cephalometric superimposition.

| MEDIDA CEFALOMETRICA | T0 PREORTOPEDICO | T1 POSTORTOPEDICO | NORMA           |
|----------------------|------------------|-------------------|-----------------|
| SNA                  | 77,08            | 78,14             | 82              |
| SNB                  | 78,05            | 77,32             | 80,4            |
| ANB                  | -0,97            | 0,82              | 1,6             |
| WITTS                | -5,23            | -0,83             | -1              |
| OVERJET OSEO         | -1,86            | 2,54              | 0-6 mm          |
| U1 FH                | 107,52           | 116,13            | 11              |
| IMPA                 | 92,81            | 88,6              | 90              |
| BJORK SUMA           | 391,40           | 393,67            | 398,2           |
| APDI                 | 87,32            | 82,52             | 85,74           |
| VIA AEREA SUP        | 11               | 14                | 9,3+/- 2,6mm    |
| VIA AEREA INF        | 12               | 15                | 11,7 +/- 2,6 mm |
| FMA                  | 23,69            | 25,63             | 26,2            |

Table 1. Cephalometric measurements.

## Discussion

In this case, early treatment of Class III malocclusion was initiated with functional orthopedic appliances, based on correcting therapeutic posture before maxillary protraction, a criterion based on the anterolateral occlusal forces transmitted by the ascending maxillary processes influencing the anterior cranial base<sup>16</sup>.

The differential diagnosis of early Class III malocclusion with pseudo-Class III, whose main characteristic is postural anterior crossbite, should be considered. The clinical way to differentiate dental and skeletal crossbite is to bring the mandible to centric relation and then evaluate molar relationship and anterior crossbite<sup>17</sup>.

Delaire recommended early correction of occlusal anomalies, ideally before the age of six<sup>16</sup>. According to McNamara, the optimal time to begin treating Class III is in early mixed dentition, coinciding with the eruption of the upper permanent central incisors. According to Hickham, optimal orthopedic results should begin before age 8<sup>18</sup>.

There are research lines on growth direction, rate, expression periods, and rate. The best indicators can be signs and family growth characteristics<sup>19</sup>.

Treatment for Class III malocclusion in growing patients may focus on orthopedic interventions, including growth redirection and modification with functional appliances, protraction masks, and chin cups<sup>9</sup>.

The advantages of early treatment include eliminating interferences, correcting skeletal, dentoalveolar, and muscular imbalances, and improving facial aesthetics for healthy psychosocial development<sup>1</sup>. Initial photographs show a concave profile characteristic of Class III malocclusions. After 5 months, a favorable change was achieved in the patient's profile. Facial convexity decreased, and significant radiographic changes are evident.

Several studies have shown that neck muscles have a common activation pattern with masticatory muscles and that their activity is greater the more occlusal contacts there are<sup>20</sup>. The size of the first cervical vertebrae may be related to sagittal skeletal class<sup>21</sup>. Head position is linked to body axis, and deviations such as kyphosis, scoliosis, and lordosis can result in head posture changes<sup>22</sup>.

Functional orthopedic appliances are characterized by maintaining the mandible in a new position, modifying its growth in the three spatial planes<sup>23</sup> (Figures 8 and 9).



**Figure 8.** Extraoral photographs post-treatment.



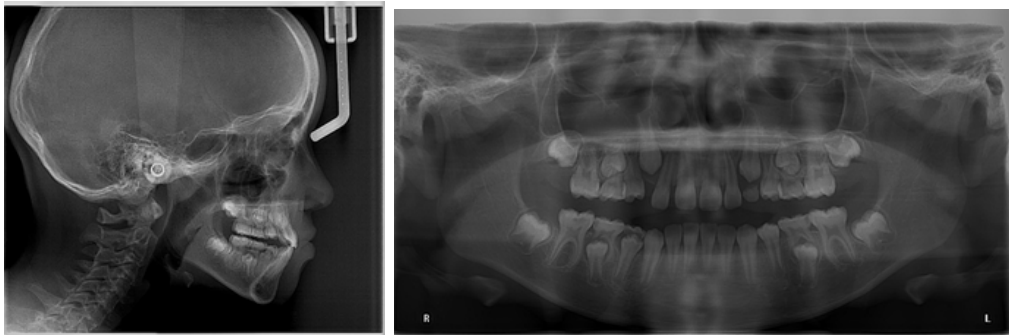
**Figure 9.** Intraoral photographs post-treatment.

Facial convexity reduction is related to anterior repositioning of point A, mandibular redirection, and soft tissue projection<sup>24</sup>. The stability of functional treatment is determined by the normalization of occlusal function, mastication, breathing, and swallowing<sup>14</sup> (Figure 10).

Torres et al. evaluated cephalometric changes in the ANB angle, restricting SNB angle increase by reducing mandibular length<sup>25</sup>.

Early treatment of Class III malocclusions with the Klammt open elastic activator may significantly reduce the need for surgical interventions<sup>3</sup>. Correct diagnosis

and etiology are fundamental<sup>26</sup>. Wolfe et al. reported in a study that the age at which Class III malocclusion can worsen varies between 6 and 16 years, considering environmental factors that may influence malocclusion development<sup>27</sup>. Toffol et al. evaluated scientific evidence on the effectiveness of early Class III treatment and found a long-term clinical success rate of 70%, with the remaining 30% relapsing within 2 years post-treatment<sup>28</sup>. Long-term follow-up is crucial for Class III malocclusion treatment due to relapse or recurrence associated with residual mandibular growth. Patients with hypognathia and hypodivergent tendencies have a better prognosis after early Class



**Figure 10.** Post-treatment Radiographs.

III treatment<sup>29</sup>. Orthodontic treatment improves facial aesthetics, particularly in the lip area in profile view<sup>30</sup>. Cephalometric measurements of the nasopharyngeal and oropharyngeal areas increase following functional orthopedic treatments<sup>31</sup>.

## Conclusions

The early treatment of Class III malocclusion using functional appliances—such as the Klammt III elastic open activator—not only improves the maxillomandibular sagittal relationship, facial profile, correction of anterior crossbite, and occlusal function, but also promotes normalization of mastication and offers therapeutic benefits

contributing to the patient's comprehensive biopsychosocial development during this stage of growth.

## Conflict of interest

The authors declare that there is no conflict of interest related to this manuscript.

## Informed consent

Written informed consent was obtained: the minor provided informed assent, and her parents provided informed consent for the publication of this case report.

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