

# Modified Quad Helix: A Case Report

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## Abstract

Anterior open bite is a challenging malocclusion to treat. Etiology composites imperative function in the diagnosis. Abnormal tongue habits results in anterior open bite or they can develop as secondary to thumb sucking. Many orthodontists have had an unfavorable proficiency of ending orthodontic treatment, with what materialized to be suitable results, but relapsed because the patient had a tongue thrust swallowing pattern. Treatment approaches must incorporate interception of habit and correction of the malocclusion. The case report explicates a modified quad helix appliance used effectively into intercept tongue thrusting habit and the concurrent correction of posterior cross bite. The modified design has the benefit of easy assembly, being flexible and more patients accommodating.

**Keywords:** Modified quad helix, Mouth breathing, Posterior cross bite, Tongue thrusting

## INTRODUCTION

An anterior open bite is one of the most difficult malocclusions to treat, and the difficulty increases considerably when it is associated with a posterior cross-bite. An anterior open bite can be caused by skeletal vertical disharmony, muscular imbalance, habits, or local alveolar growth deficiency.<sup>1-5</sup> Posterior cross bites can also have several etiologies, including transverse skeletal imbalance between the maxilla and the mandible and altered tooth positioning in a buccal-palatal or lingual direction.<sup>4,5</sup> The treatments for open bite and cross bite are determined by their etiology and diagnosis.<sup>1,2</sup> Large skeletal imbalances must be corrected surgically, but the tooth and alveolar disharmonies can be corrected by dentoalveolar movement.<sup>6</sup>

Complex malocclusions must be treated by combining treatment concepts and techniques to achieve an effective result.<sup>7</sup> This article describes the diagnosis and treatment

of a young patient with a severe anterior open bite and a posterior crossbite with tongue thrusting habit.

## CASE REPORT

A 21-year-old male patient presented with no significant medical history. His chief concern was the difficulty in lip closure and chewing food. The patient was aware of his mouth breathing and tongue thrust. The dental open bite was probably related to abnormal tongue function.

Examination of the patient revealed facial symmetry to be acceptable. On smiling, no gingival display was present (Figure 1). Intraorally, he had a 5 mm anterior open bite that extended distally to the mandibular canine. He had a Class I molar malocclusion with mild crowding and an overjet of 4 mm. The canines and the first premolars on the right and left side were in crossbite (Figure 2). Skeletally, the patient had significant incisor protrusion and a high mandibular plane angle (39) that contributed to the Class II skeletal relationship (ANB:5) and increased lower facial height (Table 1). The panoramic radiograph showed a partially impacted mandibular left third molar (Figure 3).

### Treatment Objectives

The primary objectives in the treatment of this patient were to: (1) Correct the tongue habit, (2) correct the posterior

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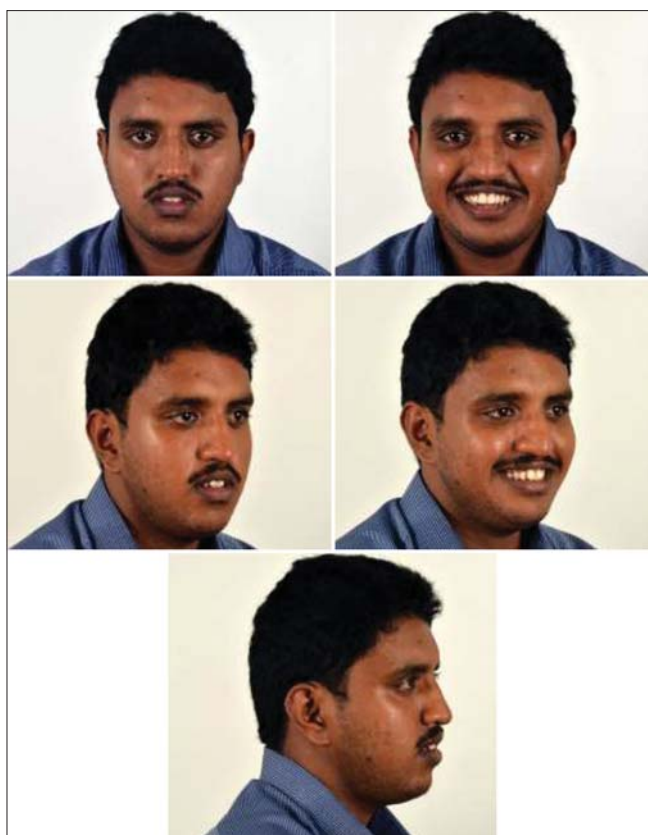


Figure 1: Pretreatment extra-oral photographs

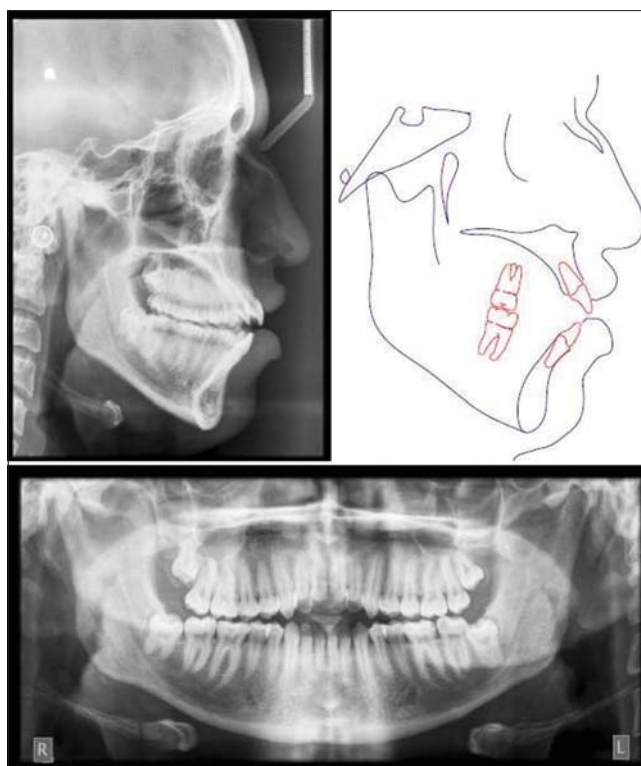


Figure 3: Pre-treatment lateral ceph with tracing and panoramic radiograph



Figure 2: Pretreatment intra-oral photographs

crossbite at the right side to achieve proper intercuspation, (3) vertically control the maxillary posterior teeth to prevent mandibular plane opening, (4) erupt the maxillary incisors to close the bite and increase tooth exposure.

Table 1: Cephalometric analysis

| Measurement | Normal values | Pre-treatment | Mid-treatment | Post-treatment |
|-------------|---------------|---------------|---------------|----------------|
| SNA         | 82            | 85            | 85            | 82             |
| SNB         | 80            | 78            | 83            | 80             |
| ANB         | 2             | 6             | 2             | 2              |
| FMA         | 22            | 32            | 30            | 30             |
| Sn GOGN     | 32            | 39            | 36            | 37             |
| Y-axis      | 59.4          | 67            | 63            | 63             |
| IMPA        | 90            | 92            | 90            | 88             |
| U1 to LI    | 130           | 108           | 113           | 112            |
| U1-NA (°)   | 22            | 36            | 32            | 29             |
| U1-NA (mm)  | 4             | 7             | 11            | 9              |
| L1-NB (°)   | 25            | 34            | 32            | 28             |
| L1-NB (mm)  | 4             | 9             | 9             | 9              |

IMPA: Incisor mandibular plane angle

### Treatment

A non-surgical alternative was chosen for this patient where in bracket placement more toward the gingival (anterior teeth) and occlusal surfaces (posterior teeth) would aid in preventing extrusion of posterior teeth and encourage closure in the anterior segment. Tongue therapy, that consisted of daily exercises of the tongue being positioned properly during speech, swallowing, and resting positions, was initiated with the goal of reducing the tongue thrust habit. Settling elastics were to be used for final settling of the posterior segment. Full-time retention was planned along with continued evaluation of tongue posture.

### Appliance Design

To correct the tongue thrusting habit and resolve the transverse, vertical, and functional deficiencies, we used an anterior modified quad helix, made of 0.036 inches stainless steel wire soldered to bands on the first permanent molars. The lingual arms of the appliance were extended to the canines, and to the posterior bridge of the quad helix, a modified tongue crib made of 0.032 inches stainless steel wire is soldered to prevent tongue thrusting habit (Figure 4).

### Treatment Progress

The maxillary and mandibular arches were banded and bonded with 0.022 × 0.028-inches MBT (3M Unitek, Monrovia, California) appliances, and continuous 0.014 inches nickel-titanium archwires were placed. A quad helix was fabricated and soldered to the banded molars for the correction of the cross bite. At every appointment, quad helix was activated for the correction of the posterior cross bite. The activation of the quad helix was carried out for 4 months along with 0.016 and 0.018 inches nickel-titanium archwires (Figure 5).



Figure 4: Modified quad helix with tongue crib

After initial alignment was obtained, continuous 0.017 × 0.025-inches nickel-titanium wires were placed for 4 months to continue alignment and begin leveling. Patient was instructed to place the tongue in the palatal region while swallowing saliva. He was extremely compliant with this exercise because he was motivated to speed the treatment process along. Six months into treatment, a modification to the quad helix was made by soldering a tongue crib to the posterior bridge to control the tongue from pushing the anterior teeth (Figure 6).

A 0.017 × 0.025-inches stainless steel archwires were placed, and the leveling of the arches continued. By about 8 months into treatment, a reverse sweep was given on the upper and



Figure 6: Intraoral photographs with modified quad helix



Figure 5: Mid-treatment photographs



Figure 6a: Mid treatment lateral ceph

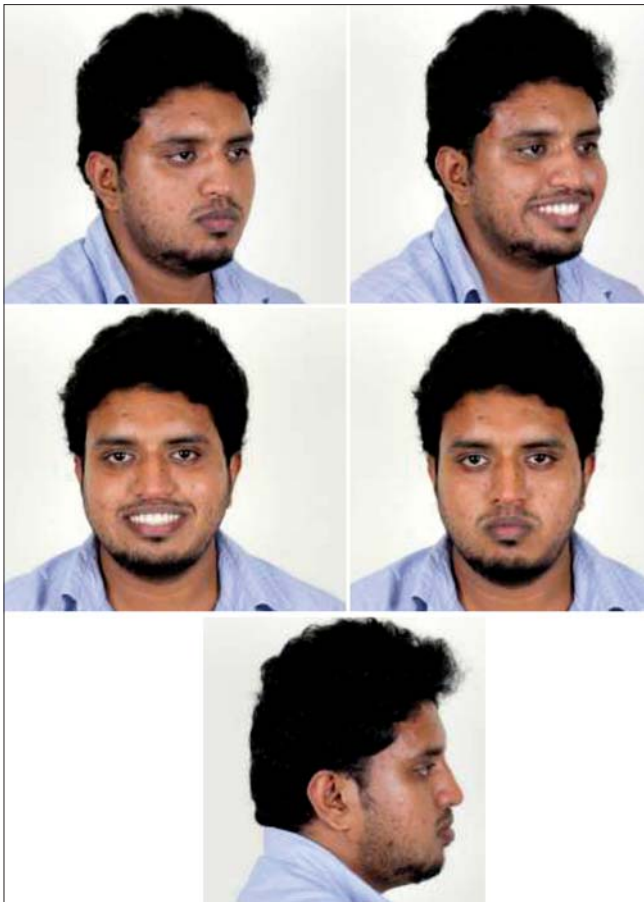


Figure 7: Post treatment extraoral photographs



Figure 8: Post treatment intraoral photographs

lower arch wires for the correction of the anterior open bite. After a month, a lower 0.016 inches reverse nickel-

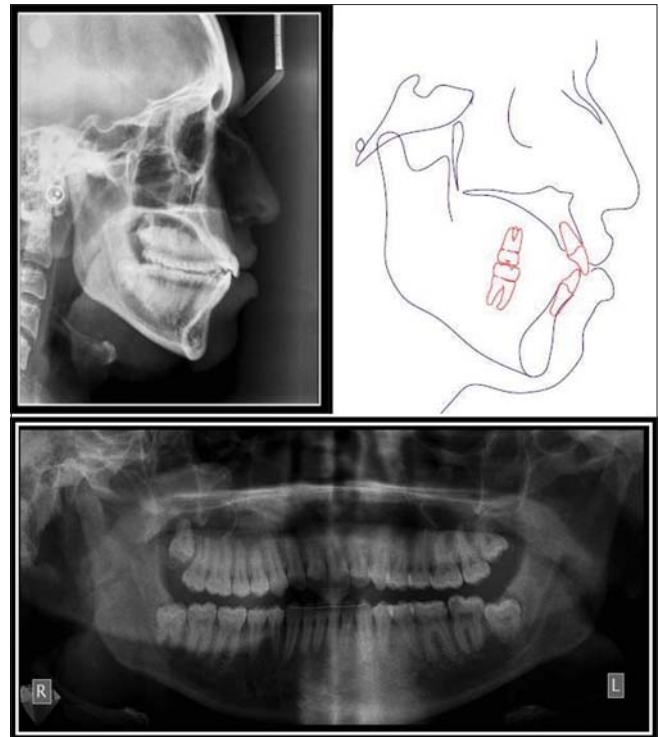


Figure 9: Post-treatment lateral ceph with tracing and panoramic radiograph

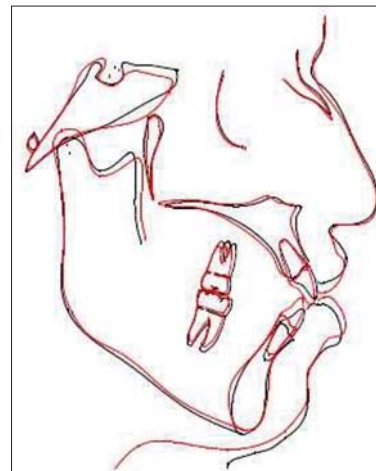


Figure 10: Post treatment cephalometric superimposition (black lines - pretreatment, red lines - post treatment)

titanium archwire along with box elastics was given. In the next appointment, there was a significant reduction in the open bite.

After 11 months of treatment, anterior open bite and posterior cross bite was completely resolved. A 0.019 × 0.025-inches stainless steel lower and a 0.014 inches nickel-titanium archwires were placed. At the same time, bilateral trapezoid elastics from the maxillary canine to the mandibular second permanent molars. After 1 month of elastic wear,

settling of the occlusion was attained, with the open bite reduced to 0 mm. Appliances were removed, and retainers were delivered. Cooperation was excellent, and the patient reported no temporomandibular joint problems during treatment (Figures 7-10).

Fulltime elastic wear continued for 2 months, tapered to night only for 1 month, and then stopped. The upper archwire was sectioned, and finishing elastics (3/4 inches, 2 oz) were used for approximately 5 weeks.

## DISCUSSION

The difficulty of managing anterior open bite malocclusions is not only in obtaining the correct diagnosis, but also in treating the case to a successful facial and dental result. The orthodontist's challenge is to minimize molar extrusion during treatment to prevent downward and backward mandibular rotation.<sup>10</sup> Faced with the limitations that routine orthodontic treatment modalities present, most orthodontists would agree that a skeletal hyperdivergent open bite malocclusion in an adult is ideally corrected with combined orthodontic treatment and orthognathic surgery. The most common surgical procedure is a LeFort I osteotomy, which allows impaction of the posterior maxilla and autorotation of the mandible.<sup>8,10</sup> This patient was hesitant to consent to the orthognathic surgical plan because of the additional expense and risks of surgery. The advantages of the orthognathic surgical option are that the overbite can be overcorrected and relapse is less than with a non-surgical approach.<sup>9,10</sup>

## CONCLUSION

The Quad Helix is one of the most versatile appliances that can be used, because it is easy to use and well tolerated by patients. The modified appliance shown here is simple to fabricate and place. It can simultaneously correct posterior crossbite, through lateral expansion, and anterior open bite, by means of a habit-preventing metal segment soldered to the posterior bridge.

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