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Non-surgical Correction of Adult Class III Malocclusion Using a Fixed Orthodontic Lower Tongue Gate with Myofunctional Therapy: A Case Report

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ABSTRACT

Objective

To report a non-surgical approach for treating borderline skeletal Class III malocclusion in an adult patient using fixed orthodontics, a lower tonguegate appliance, and myofunctional therapy to improve occlusion, facial aesthetics, and tongue posture.

Diagnosis and treatment planning

A 34-year-old Black African female presented with the chief complaint of "lower front teeth sticking out." Examination revealed a concave facial profile, a Class III molar, and canine relationships, negative overjet of 2.5 mm, anterior open bite of 2 mm, and mild maxillary and mandibular crowding. Cephalometric findings indicated mild maxillary retrognathia (SNA 83°), mandibular prognathism (SNB 82°), and a Wits appraisal of -8.7mm. A low tongue rest position was noted.

The treatment objectives were to achieve Class I molar and canine relationships, correct overbite and overjet, control tongue posture, improve smile aesthetics, and maintain stability. The patient declined orthognathic surgery due to fear of surgical procedures, as well as the added financial burden. Treatment began with full fixed appliances (0.018" edgewise) and myofunctional therapy. Class III elastics were applied. After 12 months with minimal dental change, a lower tongue gate was fabricated to limit the anterior tongue pressure, combined with continued elastics.

Results

Within six months of lower tongue gate use, positive overjet and overbite were achieved. Cephalometric changes included improved upper incisor inclination (U1–NA from 20.5° to 26.2°), reduced lower incisor proclination (L1–NB from 26.5° to 24.0°), and Wits improvement to -6.9 mm. The soft tissue profile improved, with the nasolabial angle increasing from 78.5° to 86.0°. The patient reported improved confidence and function, with no adverse effects on speech or mastication from the tongue gate appliance.

Retention included fixed 3–3 retainers, ESSIX® appliances, and continued myofunctional exercises to improve tongue posture by a Speech and Language therapist.

Conclusion

Integrating a lower tongue gate with fixed orthodontics and myofunctional therapy can be an effective non-surgical option for adult borderline Class III malocclusion by improving the dental occlusion and facial profile through addressing the tongue posture.

Keywords

Class III malocclusion, myofunctional therapy, tongue gate appliance, non-surgical adult treatment, tongue normal position, case report

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Authors Contributions

1. E Ghabrial – Conceptualisation, retrieved the case, writing, referencing and editing: Main author 70%
2. Peter Sethusa – Clinician writing and editing: Co-author 20%
3. Maxine Lundall – Clinician writing and editing article 10%

LITERATURE REVIEW

The prevalence of Class III malocclusion among US adults is 7.3% in Blacks and 4.3% in Whites. This underscores the importance of adult-specific, individualised orthodontic diagnosis, long-term treatment planning, and resource allocation for managing adult malocclusion.[1] Class III malocclusion diagnosis, prognosis, and treatment have always been a challenge for clinicians.[2] Normal occlusion and improved facial aesthetics can be achieved in skeletal Class III malocclusion through growth modification, orthodontic camouflage, or orthognathic surgery. Orthodontic treatment, combined with orthognathic surgery, remains a highly recommended treatment option for adult patients with moderate and severe skeletal Class III malocclusion.[3] However, challenges would arise when distinguishing between borderline and surgical-orthodontic Class III malocclusion cases.[4] The differential diagnosis of the various skeletal topographies associated with underlying Class III malocclusion is due to discrepancies in maxillary and mandibular growth, as well as to vertical and/or transverse problems.[5] Researchers described cephalometric analysis parameters to identify the severity of Class III malocclusions, which employ skeletal analysis of the ANB angle, Wits appraisal, and soft tissue analysis, including the Ricketts Esthetic E-line.[6,7]

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Another diagnostic challenge is differentiating between true Class III malocclusions and pseudo-Class III malocclusions, which are caused by premature occlusal contacts leading to functional forward positioning or mandibular shifting at centric occlusion.[8] The primary differential diagnosis in patients with pseudo-Class III malocclusion occurs when the mandible is guided into a normal centric relationship, allowing for a normal overjet or an edge-to-edge position of the incisors to be achieved.[8]

The aetiology of Class III malocclusion is wide-ranging and complex, with both environmental and genetic contributions.[9] The multifactorial aetiology is due to the expression of a distortion of normal development as a result of the interaction between innate factors or genetic heredity with environmental factors, resulting in various skeletal topographies of underlying Class III malocclusion, which result from discrepancies in the maxillary and mandibular growth along with vertical and/or transverse problems.[5] Orofacial myofunctional dysfunction (OMD), including breathing, chewing, swallowing, sleep, tongue, and speech disorders are a promoting factor for malocclusions.10–12 Not only are children affected by OMDs, but a high number of adults receiving orthodontic treatment, who present with dental malocclusions and temporomandibular joint disorders, also experience symptoms of OMDs, such as chewing, breathing, and speech issues.[13, 14] The influence of the tongue must be considered and investigated carefully, since the action of the tongue is responsible not only for open bites but also for Class III malocclusions.[10,14] Primozic *et al* demonstrated that individuals with Class III malocclusion exhibit significantly lower tongue posture compared to those with Class I malocclusion.15 In addition, their study revealed that tongue posture, across all skeletal classes, is intricately related to the proportional relationships between the dental and alveolar components of the maxilla and mandible.[15]

These findings highlight the importance of incorporating tongue posture and function evaluation into orthodontic diagnostics, particularly in the management of skeletal Class III and open bite malocclusion.[16] It is imperative that the orthodontist appraise muscle activity and that they conduct their orthodontic therapy in such a manner that the finished result reflects a balance between the structural changes obtained and the functional forces acting on the teeth and investing tissues at that time.[17]

Artese *et al*.[18, 19] reported that tongue gate appliances such as palatal cribs and lingual spurs are effective in disrupting abnormal tongue thrust and rest posture.[18, 19] While cribs act as physical barriers, spurs provide proprioceptive feedback. When combined with myofunctional therapy, these appliances facilitate adaptive tongue positioning and enhance long-term occlusal stability.[18, 19]

In this paper, a multidisciplinary orthodontic treatment management approach was applied to correct a negative overbite in an adult with a diagnosed skeletal and dental Class III malocclusion, utilising a fixed orthodontic appliance combined with a lower tongue gate appliance and myofunctional treatment performed by a Speech-Language pathology therapist.

PATIENT HISTORY

A 34-year-old adult Black African female presented with a chief complaint of "lower front teeth sticking out". Her medical history was non-contributory, and she reported no history of temporomandibular joint (TMJ) pain or parafunctional habits. Oral hygiene was consistently maintained at a reasonable level, with no active caries or periodontal disease noted at the time of presentation. The patient reported that her malocclusion had been present and untreated since adolescence.

CLINICAL EXAMINATION

The patient's profile was concave (Figure 1). The lower lip was prominent, and the lips were incompetent. The vertical facial proportion was moderate, and no asymmetries were observed. In both centric occlusion (CO) and centric relation (CR), molar and canine relationships were Class III, and the incisors had an anterior cross bite with a negative overjet of 2.5 mm. The curve of Spee was mild with an open bite of 2 mm in the 22 area (Figure 1). A space shortage of 4 mm was found in the maxillary arch and 2 mm in the mandibular arch, with a Bolton discrepancy of 0.80 in the anterior segment and 0.95 in the overall arch. These figures suggest a discrepancy in tooth size in the maxillary arch owing to the small size of the lateral incisors. A lower tongue rest position, without a tongue tie, was noticed and confirmed by the patient when asked where the tongue tip rested. The absence of a diagnosis of functional shift and the presence of a lower tongue rest position direct the treatment towards addressing the underlying myofunctional disorder, which affects skeletal and dental relationships directly.

The pre-treatment cephalometric, characterised by mild maxillary retrognathia (SNA 83°) and mandibular prognathism (SNB 82°). The Wits (-8.7 mm) indicated CL III skeletal relationship. Vertical dimension cephalometric analysis revealed an SN-GoME angle of 37.0°, and the Y-axis of 72.0°. Increased lower facial height to 60.2% (Table I), suggesting a mild vertical growth pattern. Furthermore, the maxillary incisors were retroclined (U1-NA 20.5°), while the mandibular incisors were proclined (L1-NB 26.5°) as characteristics of skeletal Class III malocclusion (Table I). The cephalometric soft tissue measurements, a facial contour angle of -1.3°, and a Holdaway angle of 10.6°, indicated a protrusive lower jaw. The distance from the lower lip to the E-line was 3.7 mm, also indicating a protrusive lower lip, consistent with the CLIII facial profile.

TREATMENT OBJECTIVES

(1) to establish Class I canine and molar relationships.
(2) to control the tongue posture;
(3) to correct overbite and overjet;
(4) to provide an aesthetic smile; and
(5) to reduce relapse tendency.

TREATMENT ALTERNATIVES

The first treatment option was to prepare the patient for an orthodontic fixed appliance in combination with orthognathic surgery. The second option, a non-surgical option, uses Class III mechanics combined with myofunctional therapy. According to the treatment progress evaluation, a lower tongue gate could be recommended. The patient agreed on the non-surgical option, which has been commenced as follows:

TREATMENT PROGRESS

1. Orthodontic combined with myofunctional treatment phase

- Full fixed appliances (0.018" edgewise) were bonded in both arches.

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- The myofunctional therapy was provided by a speech therapist and consisted of a structured programme of approximately six to seven sessions aimed at correcting abnormal oral habits and tongue posture. Therapy progressed in stages, beginning with assessment of nasal breathing and bite function, followed by training in correct tongue-tip and blade positioning, bolus control during swallowing, saliva management, liquid swallowing, and, later, structured food-chewing patterns. A reinforcement phase of approximately 8–10 weeks was then used to help establish the new functional habits and encourage self-monitoring. Orthodontic input involved supporting tongue posture correction, monitoring dental changes, and coordinating management with the speech therapist to improve functional and occlusal outcomes
- After the 7s were bonded, advancement to 0.017x0.022" stainless steel and Class III elastics (3/16", 4.5 oz.) were used to correct Class III malocclusion.
- After 12 months, re-evaluation of the treatment progress showed no improvement in the Class III discrepancy, and a lower tongue gate appliance was discussed as a last resort to avoid the surgical option.

2. Tongue gate appliance placement

- An intraoral scan was obtained, and the lower tongue gate was laboratory-manufactured
- The design included a fixed lower tongue gate wire along the lingual surface of the mandibular incisor teeth and soldered to the lower first molar bands. (Figure 4)

3. Inter-arch mechanics: Class III correction

- Lower tongue gate was cemented on the lower first molars (Figure 4) and continuation of Class III elastics (3/16", 4.5 oz.) to correct the Class III molar and canine relationship.
- The Class III malocclusion was corrected within six months using a lower tongue gate and
- Class III elastics, resulting in a Class I molar and canine relationship, as well as a positive overjet and overbite.

4. Finishing and retention planning

- After creating mesial and distal spaces for teeth 12 and 22, the patient was referred to a dentist for the build-up of 12 and 22 to correct the Bolton discrepancy.
- Finishing and detailing were performed using light elastics and arch coordination.
- A retention protocol with a fixed 3-3 retainer and ESSIX® retainers was prescribed, along with myofunctional exercises to maintain results.

An informal post-treatment discussion with the patient was conducted, focusing mainly on comfort, adaptation to the appliance, and the patient's perceived benefits from the lingual tongue gate appliance. The patient reported positive adaptation to the appliance and noticed improvement in biting function

TREATMENT RESULTS

The treatment plan was a satisfactory non-surgical alternative, and the treatment objectives were achieved (Figure 2 and Table 1). Correction of malocclusion was achieved through skeletal and dentoalveolar adjustments. A Class I canine and molar relationship was established with good alignment. A positive overjet and overbite were established. The teeth position was controlled while the mandibular incisors were retracted, resulting in improved incisor inclination after treatment. The maxillary incisors were slightly proclined, resulting in an improvement of upper lip prominence and a better facial profile was achieved. Skeletal cephalometric measurements showed improvement, which may be attributed to corrected tongue posture and functional adaptation contributing to slight positional changes, including possible condylar repositioning and improvement in the

Table I: Pre-treatment and post-treatment cephalometric measurements

	Measurement	Norm	Pre-treatment	Post-treatment
Maxilla	SNA (°)	84.7°	83.0°	83.0°
	Convexity (mm)	5.7	1.2	2.0
Mandible	SNB ° ()	81.0°	82.0°	81.0°
	Facial Angle (°)	88.3°	95.5°	94.4°
	Pog-NB (mm)	2.4	-0.9	-2.8
Intra-arch	ANB (°)	1.6°	1.0°	2.0°
	Wits (mm)	-1.0	-8.7	-6.4
Vertical dimension	SN-GoME/MPA ()	32.0°	37.0°	39.0°
	Y-Axis (°)	67.0°	72.0°	72.0°
	UFH (%)	46.0	39.8	39.9
	LFH (%)	54.0	60.2	60.1
Dental	U1-NA (°)	22.8°	20.5°	26.2°
	U1-NA (mm)	4.3	5.6	8.0
	L1-NB (°)	25.3°	26.5°	24.0°
	L1-NB (mm)	4.0	8.2	7.0
	Interincisal Angle (U1-L1)	123.0°	132.2°	127.6°
Soft tissue	Facial Contour Angle (°)	-9.5°	–1.3°	-3.3°
	Lower lip to E-line (mm)	5.0	3.7	4.1
	Holdaway angle (°)	8.0°	10.6 °	11.0°
	Nasolabial Angle (°)	102.0°	78.5°	86.0°

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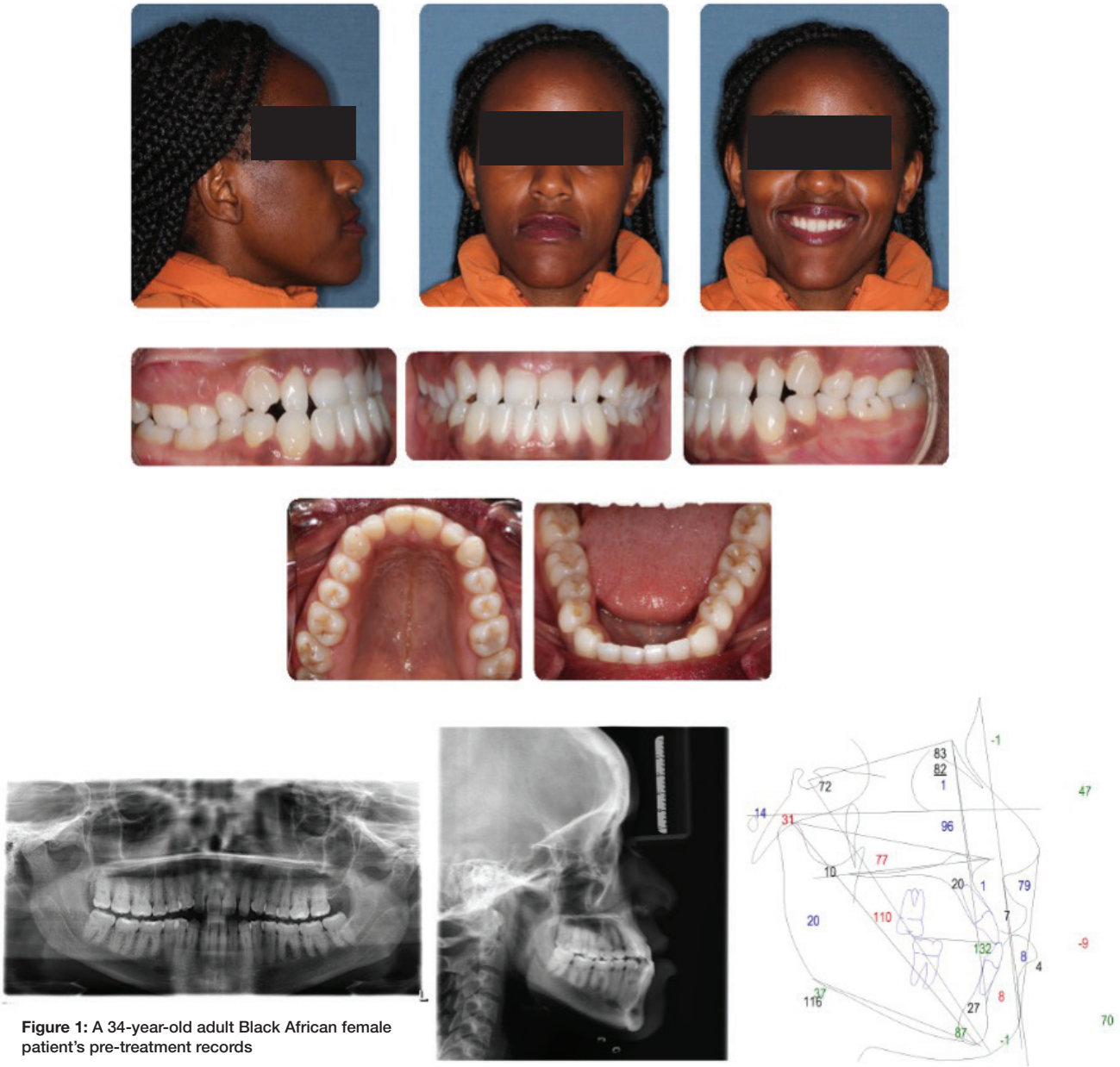


Figure 1: A 34-year-old adult Black African female patient's pre-treatment records

Class III relationship. No adverse TMJ effects were observed following treatment in the present case.

DISCUSSION

Assessing orofacial myofunctional disorder (OMD), researchers and clinicians employed various assessment methods, such as the Orofacial Myofunctional Evaluation with Scores (OMES), which comprises three subscales: appearance and posture, mobility, and function.[14] Others use clinical evaluation, observing the lips and the position of the tongue during deglutition and rest, as well as the lingual frenulum and tongue position during the pronunciation of established phonemes.[11] In this case, we asked the patient about the tongue tip resting position and clinically observed its appearance and posture, noting any deviation from the normal resting position, where the tongue tip typically rests approximately 5 mm behind the upper incisors at the incisive papilla. [20]

The treatment protocol for controlling tongue posture in CLIII malocclusion aligns with that of Arat and Arman, who use a tongue crib to alter tongue posture, which contributes to mandibular protrusion, increases mandibular length, and promotes the development of anterior cross bite.[21] In addition, in agreement with Zhao *et al*., effective management of Class III malocclusion requires the integration of behavioural modification and myofunctional therapy to correct perioral muscular dysfunction.[22,23]

The lower tongue gate, in this case, demonstrated stable results as it not only obstructs the tongue pressure of the patient towards the lower anterior teeth but also alters the tongue muscular activity, aligning with the findings from Taslan *et al*., who concluded that tongue gate appliance wear results in a disturbance in intraoral pressure equilibrium and shows tongue adaptation to the new tongue resting and swallowing positions created by the appliance.[24] The tongue gate effect could be explained by limiting the contractions of the mylohyoid muscles, thus preventing protraction of the mandible.[25] This explanation of the CLIII correction also justifies diagnosing this case as a pseudo-Class III malocclusion.[26]

A post-treatment cranial base superimposition of the lateral cephalometric radiograph with the pre-treatment tracing revealed predominantly horizontal posterior displacement

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of the mandible (Figure 2). Dentally, both upper and lower incisors exhibited protraction, which contrasts with the typical camouflage treatment pattern involving maxillary incisor flaring and mandibular incisor retraction.[2]

Myofunctional therapy combined with fixed orthodontic appliances did not fully correct the malocclusion. Nonetheless, it would contribute to post-treatment stability after the use of a tongue gate appliance, consistent with findings reported in previous studies.[19, 27, 28] This case report highlights the importance of multidisciplinary collaboration in managing malocclusion.[19] In agreement with Deregibus, effective coordination between the orthodontist and the speech-language therapist is essential for addressing both simple and complex malocclusions in growing and non-growing patients.[11]

Despite the advantages of using a lower fixed tongue gate, a key limitation is the patient's compliance and tolerance, which can affect the success of the treatment outcome.[20] Nine patient interviews were conducted with patients who received lower tongue gates to assess their experience with wearing the device. Of the participants, 86% reported an improvement in their bite alignment after using the lingual tongue gate appliance. In 92% of individuals, underbite and overbite were reduced; 86% reported no adverse effect on masticatory function, and 92% stated that the lingual tongue gate appliance improved their confidence due to noticeable bite improvement. In agreement with Shams, the tongue gate appliance demonstrated similarities to tongue spurs in terms of speech adaptation, faster adjustment, eating comfort, aesthetics, and pain tolerance.[29] Notably, none of the interviewed patients expressed a desire to discontinue using the appliance due to the improvements achieved. Furthermore, prior patient education on the benefits of modifying tongue posture was reported to enhance acceptance and tolerance of the lingual tongue gate.

Clinicians should take into consideration the mandibular symphysis dimensions when treating patients with a vertical facial pattern as these patients are more likely to have narrow mandibular symphysis dimensions and may require surgery or corticotomy.[30] Such growth patterns have a tendency of rotating the mandible downward and backward leading to the development of an anterior open bite malocclusion.[31]

Orthodontic services should therefore be comprehensive, delivering appropriate treatment in response to specific situations, resulting in the efficient treatment of non-skeletal and skeletal problems.[32]

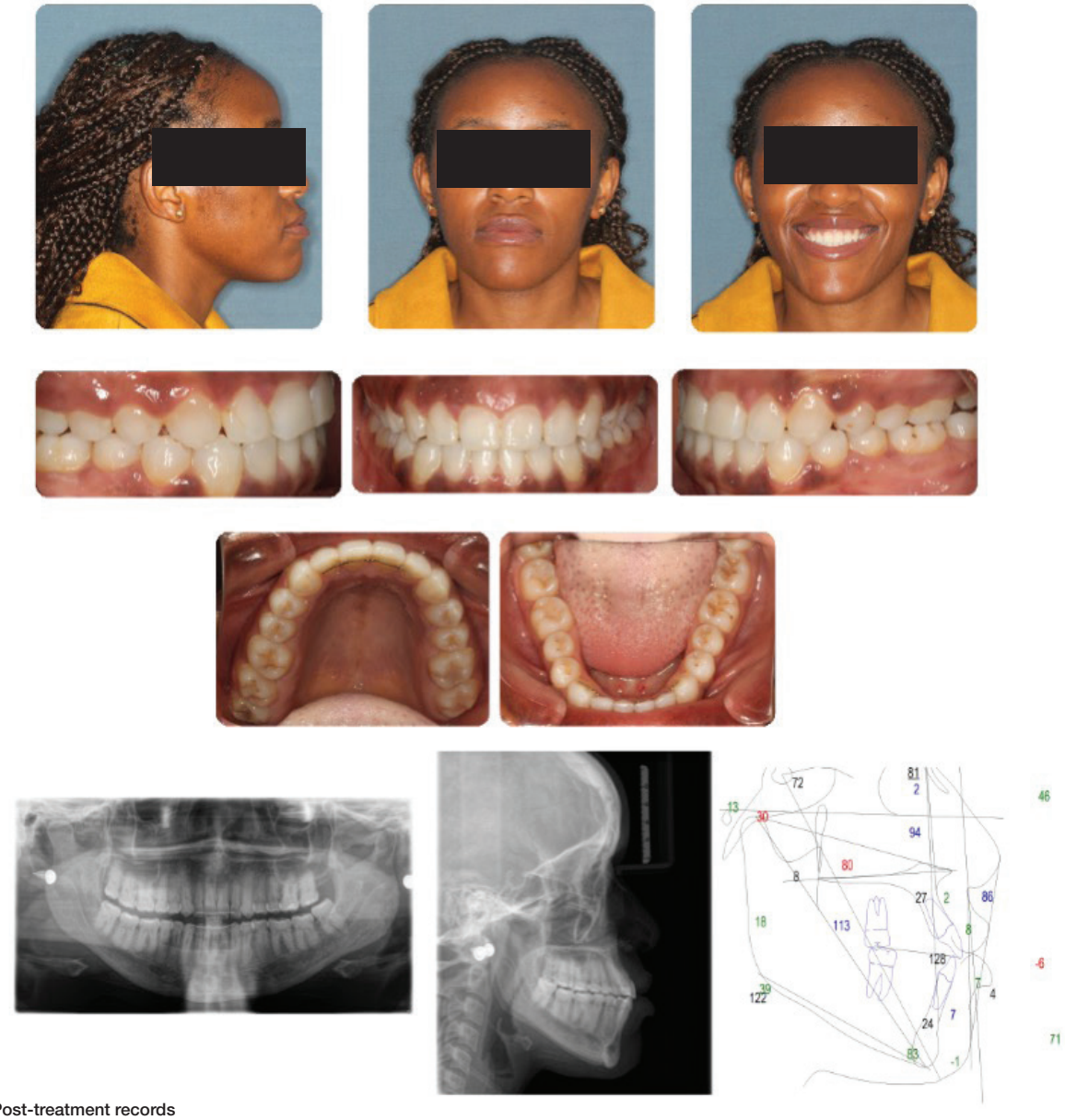


Figure 2: Post-treatment records

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Figure 3: Intraoral lingual tongue gate appliance

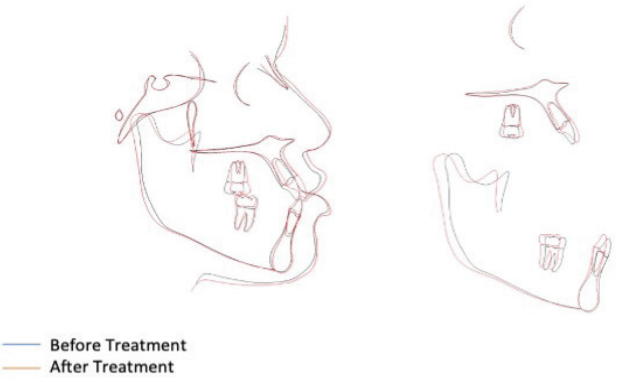


Figure 4: Superimposition (on the SN plane and registering on sella) of lateral cephalometric radiographs before and after treatment

CONCLUSION

This case report highlights a successful multidisciplinary approach between the orthodontist and the speech and language therapist in managing a borderline Class III malocclusion in an adult patient. The combination of a fixed lower tongue gate appliance, fixed orthodontics, and myofunctional therapy resulted in significant improvements in occlusal relationships, facial aesthetics, and post-treatment stability, thereby avoiding the need for surgery. The lower fixed Tongue Gate appliance was well tolerated and effective in modifying tongue posture, contributing to favourable mandibular repositioning. Long-term retention and regular follow-up monitoring of tongue posture remain essential for maintaining treatment stability. Overall, patient tolerance was high, and both functional and aesthetic outcomes were positive.

This report underscores the importance of adopting a multidisciplinary and functional approach in dental practice, moving beyond symptomatic treatment to address the underlying causes of skeletal and dental discrepancies, and restore optimal orofacial function.

LIMITATIONS AND CHALLENGES

While this case report presents valuable insights into the success of using a lower fixed tongue gate in combination with orthodontic treatment and myofascial therapy, it remains inherently limited in its contribution to evidence-based practice. Case reports represent the lowest level of clinical evidence due to their descriptive, non-comparative nature and lack of control over confounding variables.

Declaration of patient consent

The authors certify that they have obtained the appropriate patient consent form. In the form, the Patient gave her consent for images and/or other clinical information to be reported in the journal. The patient understood that their names and initials will not be published, and that due efforts will be made to conceal their identity; however, anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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