



Lingual Orthodontics and Surgical Solutions for Severe Deep Bite and Multiple Dental Agenesis: Case Report

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DOI: 10.31080/ASDS.2024.08.1878

Received: June 27, 2024

Published: July 12, 2024

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Abstract

Lingual orthodontics represents a significant advancement in dental treatments, particularly for malocclusions and dental anomalies. This article examines its effectiveness when combined with surgical bilateral sagittal split osteotomy (BSSO) in treating severe deep bite and multiple dental agenesis. Dental agenesis, the congenital absence of teeth, poses various challenges due to genetic and environmental factors affecting tooth development. It impacts both primary and permanent dentitions, leading to malocclusions and aesthetic concerns that affect oral health and self-esteem. Treatment options range from orthodontic interventions to prosthodontic rehabilitation and surgical procedures, underscoring the importance of early diagnosis and intervention.

The case report presented highlights the complexities of managing severe deep bite and multiple dental agenesis through a multidisciplinary approach. A severe deep bite, characterized by an excessive vertical overlap of incisors, can cause aesthetic and functional issues, including temporomandibular joint problems. Multiple dental agenesis, the congenital absence of multiple teeth, complicates treatment plans, necessitating innovative rehabilitation strategies. Lingual orthodontics, with its discreet and patient-friendly approach, offers an effective alternative to traditional labial braces, providing aesthetic advantages by placing brackets and wires on the lingual surfaces of teeth. This technique is particularly beneficial in addressing malocclusions and missing teeth with customized treatment plans.

However, the intricate nature of severe deep bite and multiple dental agenesis often requires a combination of orthodontic and surgical interventions. Surgical procedures such as orthognathic surgery and implant placement are crucial for addressing skeletal discrepancies and restoring missing teeth. Coordination between orthodontic and surgical teams is essential for achieving harmonious treatment outcomes, addressing both functional and aesthetic discrepancies.

The case report details the patient's initial condition, treatment planning, and the execution of combined orthodontic and surgical interventions. The patient's journey, including the initial clinical and radiological examination, diagnosis of skeletal Class II malocclusion, and dental-alveolar discrepancies, is thoroughly discussed. The treatment involved using maxillary lingual multi-bracket appliances to prepare the dentition before the surgical phase. This approach aimed to increase lower facial height and achieve skeletal harmonization. The staged treatment plan reflects a modern interdisciplinary approach, highlighting the potential for optimal results in complex orthodontic cases and emphasizing the importance of collaboration in contemporary dental practice.

Keywords: Lingual Orthodontics; Dental Agenesis; Deep Bite; Bilateral Sagittal Split Osteotomy (BSSO); Malocclusion; Orthognathic surgery

Abbreviations

BSSO: Bilateral Sagittal Split Osteotomy

Introduction

Lingual orthodontics has emerged as a cutting-edge approach in the field of dentistry, revolutionizing the treatment of various malocclusions and dental anomalies [3]. This article delves into the intricate realm of lingual orthodontics and explores its efficacy in conjunction with surgical bilateral sagittal split osteotomy (BSSO) for the management of severe deep bite and multiple dental agenesis [26]. Dental agenesis refers to the congenital absence of teeth, which can occur in both primary and permanent dentitions. This condition results from various genetic and environmental factors during tooth development. Dental agenesis is often termed "tooth agenesis" or "hypodontia." It can lead to various dental issues including malocclusion and aesthetic concerns, impacting oral health and self-esteem [22-24]. Treatment options may include orthodontic interventions, prosthodontic rehabilitation, or surgical procedures depending on the severity and location of the missing teeth. Early diagnosis and intervention are crucial for managing dental agenesis and minimizing its impact on oral function and aesthetics. Through a comprehensive case report, we aim to elucidate the challenges posed by these complex orthodontic issues and highlight the successful integration of lingual orthodontics and surgical interventions in achieving optimal treatment outcomes [14].

The prevalence of severe deep bite and multiple dental agenesis poses significant clinical challenges, requiring a multidisciplinary approach for comprehensive correction. Deep bite, characterized by excessive vertical overlap of the maxillary and mandibular incisors, can lead to aesthetic concerns, functional impairments, and potential temporomandibular joint problems. Simultaneously, multiple dental agenesis, the congenital absence of multiple teeth, further complicates the treatment plan, necessitating innovative strategies for rehabilitation.

Lingual orthodontics, with its discreet and patient-friendly approach, has gained popularity as an alternative to traditional labial braces [1]. Placing brackets and wires on the lingual surfaces of teeth allows for effective tooth movement while maintaining a more aesthetically pleasing appearance [2]. In cases of severe deep bite and multiple dental agenesis, lingual orthodontics provide a unique advantage by addressing both the malocclusion and the missing teeth with customized treatment plans [4]. However, the intricate nature of severe deep bite and multiple dental agenesis often requires a combination of orthodontic and surgical inter-

ventions to achieve optimal results. Surgical solutions, such as orthognathic surgery and implant placement, play a pivotal role in addressing skeletal discrepancies and restoring missing teeth. The coordination between orthodontic and surgical teams has become paramount to ensure a harmonious treatment approach, addressing both functional and aesthetic discrepancies.

This article presents a detailed case report that exemplifies the successful integration of lingual orthodontics and surgical solutions in the management of a patient with severe deep bite and multiple dental agenesis. The patient's initial condition, treatment planning, and the step-by-step execution of the combined orthodontic and surgical interventions will be thoroughly discussed. Additionally, outcomes, complications, and long-term stability will be critically evaluated to provide valuable insights for clinicians facing similar challenging cases [6-8].

In conclusion, this article aims to contribute to the existing body of knowledge on lingual orthodontics and surgical solutions by presenting a comprehensive case report on the successful management of severe deep bite and multiple dental agenesis. The integration of these innovative approaches showcases the potential for achieving optimal outcomes in complex orthodontic scenarios, emphasizing the importance of a collaborative and multidisciplinary approach in modern dental practice.

A young patient with no previous orthodontic history presents with a chief complaint related to aesthetics. Following a clinical and radiological examination, a diagnosis is established. The patient exhibits skeletal Class II malocclusion and dental-alveolar discrepancies. The treatment plan involves: 1) initiating orthodontic treatment with maxillary lingual multi-bracket appliances and lingual vestibular multi-bracket appliances to prepare the dentition before 2) the surgical phase [9-11].

The clinical evaluation revealed the presence of a skeletal Class II malocclusion, indicating a discrepancy in the relationship between the upper and lower jaws. Additionally, dental-alveolar issues were identified, highlighting concerns related to the positioning and alignment of the teeth within the supporting alveolar bone [14].

This adult patient with 4 dental agenesis. and severe skeletal Class II malocclusion, with traumatic overbite, presents for aesthetic consultation.

Instead of teeth 44 and 45, she has her second deciduous molars, which we decided to keep, in order to avoid extracting other permanent teeth.

Our treatment of choice combines maxillary lingual brackets, which allow us to increase her lower facial height, before a surgical step that will ensure skeletal harmonization.

Materials and Methods

Initial Assessment

The study began with a comprehensive evaluation of the patient, including the collection of the following records:

- **Initial Extraoral Photos:** Captured to document the facial aesthetics and profile before any treatment.
- **Initial Intraoral Photos:** Taken to assess the initial condition of the teeth and oral cavity.
- **Panoramic Radiograph:** Used to evaluate the overall dental and skeletal structure, including the presence or absence of teeth.
- **Lateral Cephalometric Radiograph:** Utilized to analyze the skeletal and dental relationships in the sagittal plane.

Orthodontic Treatment Phase

To address the patient's deep bite and multiple dental agenesis, a detailed orthodontic treatment plan was implemented:

Lingual Orthodontic Appliances

Maxillary Arch

- **Lingual ORG Brackets:** Applied to the maxillary anterior teeth.
- **Innovation-L Brackets (0.018 x 0.025 inch):** Utilized for the upper arch to ensure discreet and effective tooth movement.

Mandibular Arch

- **Ceramic Brackets:** Chosen for the mandibular teeth for aesthetic purposes.

Lingual vestibular multi-bracket appliances

- Employed to enhance the overall preparation and alignment of the dentition.
- Ensured precise positioning of the teeth within the alveolar bone.

Objective

- The coordination between the maxillary lingual and mandibular vestibular appliances aimed to establish an ideal foundation for subsequent surgical interventions by optimizing dental alignment and preparing the dental-alveolar complex.

Pre-surgical evaluation

After completing the initial orthodontic phase, a pre-surgical assessment was conducted, including:

- **Intraoral Photos Before Orthognathic Surgery:** Documented the dental alignment and occlusion post-orthodontic treatment.
- **Panoramic Radiograph:** Reviewed to plan the surgical intervention and ensure proper alignment.
- **Lateral Cephalometric Radiograph:** Analyzed to confirm the skeletal relationships and the need for surgical adjustments.

Surgical phase

The second phase involved a tailored surgical approach to correct skeletal discrepancies:

Orthognathic Surgery

- **Bilateral Sagittal Split Osteotomy (BSSO):** Performed to optimize the occlusal relationship and harmonize the upper and lower jaws.
- This phase was strategically timed after the orthodontic treatment to capitalize on the improved dental alignment achieved through lingual appliances.

Post-surgical evaluation

- **Intraoral Photos After Orthognathic Surgery:** Captured to document the immediate outcomes of the surgical intervention.
- **Panoramic Radiograph:** Taken to assess the overall dental and skeletal structures post-surgery.
- **Lateral Cephalometric Radiograph:** Utilized to evaluate the skeletal and dental changes following surgery.

Final assessment and follow-up

To evaluate the long-term success and stability of the treatment, the following records were collected:

- **Intraoral Photos at the End of the Treatment:** Documented the final dental alignment and occlusion.
- **Panoramic Radiograph at the End of the Treatment:** Used to confirm the overall dental and skeletal outcomes.
- **Lateral Cephalometric Radiographs Before and After:** Compared to assess the changes in skeletal and dental relationships.
- **Extraoral Photos:** Captured to evaluate the overall facial aesthetics and profile post-treatment.

The combination of lingual orthodontics and surgical interventions, documented through these comprehensive records, demonstrated the effectiveness of a multidisciplinary approach in man-

aging complex orthodontic cases involving severe deep bite and multiple dental agenesis.

Initial extraoral photos before orthodontic treatment



Figure a

Initial intraoral photos before orthodontic treatment



Figure b

Panoramic radiograph before orthodontic treatment



Figure c

Panoramic radiograph before orthodontic treatment



Figure d

Lateral cephalometric radiograph before orthodontic treatment

ensures discreet and esthetically pleasing tooth movement while facilitating the necessary adjustments to the dental-alveolar complex [12,13].

To address these concerns and achieve the desired aesthetic outcome, a comprehensive treatment approach is proposed. The first phase involves orthodontic treatment utilizing lingual multi-bracket appliances on the maxillary arch. The lingual approach

Intraoral photos with maxillary lingual brackets and mandibular labial ceramic brackets



Figure e

Lingual ORG brackets for the maxillary anterior teeth and Innovation-L 0.018 x 0.025 inch is the choice for the upper arch, with ceramic brackets for the mandibular teeth.

Simultaneously, lingual vestibular multi-bracket appliances are employed to enhance the overall preparation of the dentition. This

dual approach allows for a meticulous and precise alignment of the teeth, ensuring that they are optimally positioned within the alveolar bone. The coordination between maxillary lingual and mandibular vestibular appliances aims to establish an ideal foundation for subsequent surgical interventions [15,16,18].

Intraoral photos before orthognathic surgery



Figure f

The second phase of the treatment plan involves a surgical component. While the specific surgical procedures may vary based on the individual patient's needs, the overarching goal is to address skeletal discrepancies and optimize the relationship between the upper and lower jaws (5). This surgical phase is strategically timed

after the completion of the initial orthodontic treatment, capitalizing on the improved dental alignment achieved through the lingual appliances.

Intraoral photos after orthognathic surgery



Figure g

Panoramic radiograph at the end of the treatment

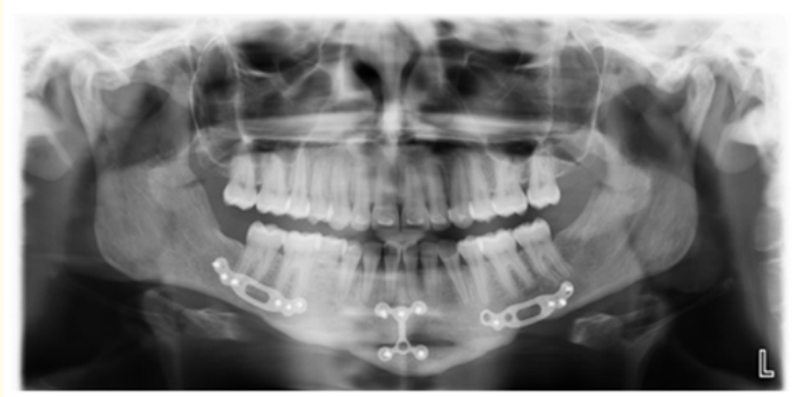


Figure h

Lateral cephalometric radiograph at the end of the treatment



Figure i

Intraoral photos at the end of the treatment



Figure j

Lateral cephalometric radiographs before and after



Figure k

Extraoral photos



Figure 1

Results and Discussion

Results

The combination of lingual orthodontics and surgical intervention demonstrated significant improvements in the patient's dental and skeletal structures. The initial assessment revealed a severe deep bite and multiple dental agenesis, compounded by a skeletal Class II malocclusion and dental-alveolar discrepancies. The treatment plan was designed to address these complexities through a phased, multidisciplinary approach.

Orthodontic Treatment Outcomes

- **Dental Alignment:** The use of maxillary lingual multi-bracket appliances effectively repositioned the maxillary anterior teeth, while ceramic brackets on the mandibular teeth facilitated discreet yet efficient tooth movement. The combination of lingual and vestibular appliances optimized dental alignment, setting a solid foundation for subsequent surgical interventions.

- **Aesthetic Improvement:** The lingual approach provided a significant aesthetic advantage, as the braces were not visible, enhancing patient satisfaction and compliance.

Surgical Outcomes

- **Skeletal Adjustment:** The bilateral sagittal split osteotomy (BSSO) was successful in addressing the skeletal discrepancies. The procedure corrected the occlusal relationship between the upper and lower jaws, resulting in improved function and aesthetics.
- **Post-Surgical Stability:** The post-surgical evaluation indicated stable occlusal relationships and enhanced facial symmetry. Intraoral and panoramic radiographs confirmed the correct alignment and positioning of the jaws and teeth.
- **Functionality:** Improvements in chewing function and a reduction in temporomandibular joint discomfort were reported by the patient, indicating a successful functional outcome.

Long-Term Stability

- Follow-up assessments, including lateral cephalometric radiographs and extraoral photos, showed sustained stability in dental and skeletal corrections. The patient’s oral health and aesthetic outcomes remained consistent over time, demonstrating the efficacy of the integrated treatment approach.

Discussion

The integration of lingual orthodontics and surgical intervention presents a viable solution for complex orthodontic cases, particularly those involving severe deep bite and multiple dental agenesis. This case underscores several key insights

Efficacy of lingual orthodontics

- Lingual orthodontics offers a discreet and effective method for correcting malocclusions, providing an aesthetic advantage that traditional labial braces lack. This is especially important for patients concerned with the visibility of orthodontic appliances.
- The use of lingual ORG brackets and Innovation-L brackets on the maxillary teeth, coupled with ceramic brackets on the mandibular teeth, allowed for precise and controlled tooth movement, essential for preparing the dentition for surgical intervention.

Importance of multidisciplinary approach

- The complexity of severe deep bite and dental agenesis necessitates a coordinated effort between orthodontic and surgical teams. This case illustrates the need for meticulous planning and execution of both orthodontic and surgical phases to achieve optimal results.

- Early diagnosis and a comprehensive treatment plan that includes both orthodontic and surgical components are crucial for addressing functional and aesthetic concerns effectively.

Patient satisfaction and compliance

- The discreet nature of lingual orthodontics significantly contributed to patient satisfaction, promoting better compliance throughout the treatment duration. This is a critical factor in achieving successful outcomes in orthodontic treatments.
- The positive aesthetic and functional results post-treatment enhanced the patient’s self-esteem and overall oral health, highlighting the importance of considering patient-centric approaches in orthodontic care.

Challenges and solutions

- Managing multiple dental agenesis alongside severe malocclusions presents significant challenges. However, the innovative use of lingual orthodontics and well-timed surgical interventions can overcome these hurdles.
- Ensuring long-term stability remains a critical aspect of treatment success. The consistent follow-up and use of comprehensive diagnostic tools helped in maintaining the treatment outcomes over time.

In conclusion, the combined use of lingual orthodontics and surgical interventions, such as BSSO, offers an effective approach for managing severe orthodontic cases. This case report contributes valuable insights into the benefits and challenges of such multidisciplinary treatments, reinforcing the importance of collaboration in modern dental practice.





Figure m

Conclusions

The proposed treatment plan for this young adult patient encompasses a staged approach, beginning with lingual orthodontic treatment to address the skeletal and dental-alveolar concerns [25,27,28]. The subsequent surgical phase with a bilateral sagittal split osteotomy (BSSO) will further refine the occlusal relationship and contribute to achieving the desired aesthetic outcome. This comprehensive and coordinated approach reflects the modern interdisciplinary nature of orthodontic care, aiming to provide optimal results for the patient’s overall oral health and esthetics [17,19,20,21].

Conflict of Interest

The authors declare that there is no financial interest or any conflict of interest related to this study.

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