



Treatment of Lateral Functional Shift of the Mandible: A Case Report

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Abstract

Although functional mandibular deviations are a common clinical issue, their diagnosis and treatment remain challenging. Orthodontic management of these conditions requires a thorough and precise assessment, especially in terms of functional aspects. With careful diagnosis, treatment outcomes can be stable and effective. This article presents a clinical case successfully managed, highlighting the importance of an accurate diagnosis and its direct impact on treatment success. By providing a structured clinical framework, we aim to offer orthodontists a practical guide for addressing lateral functional shifts of the mandible.

Subject Areas

Dentistry

Keywords

Orthodontics, Lateral Functional Shift, Functional Mandibular Deviation, Mandible

1. Introduction

Mandibular deviations are prevalent malocclusions observed in orthodontic practice, commonly resulting in facial asymmetry and misalignments in the chin and dental midlines [1]. The prevalence of such asymmetries in adults is estimated at 44.8% [2].

Mandibular deviations can be categorized into dental, skeletal, and functional causes [3]. These deviations can have significant impacts on both esthetics and function, and their treatment requires careful evaluation to determine the most appropriate approach [3] [4].

One particular manifestation of these deviations is the lateral functional shift of the mandible, which is defined by the transverse rotation of the entire mandible about a vertical axis, causing a deviation toward one side of the head [5]. This condition not only affects facial aesthetics but also impacts mandibular function, as the lateral displacement of the chin often contributes to asymmetry and occlusal disharmony [4] [5].

The functional nature of this shift often makes it more challenging to diagnose, as it lacks clear skeletal or dental markers. An inaccurate or incomplete diagnosis of functional deviations can lead to suboptimal treatment outcomes, including instability or inadequate esthetic improvement [3]-[5]. Therefore, a thorough and precise diagnostic process is essential to ensure successful and stable treatment for patients.

The aim of this work is to explore, through a clinical case, the importance of accurate diagnosis and effective intervention for the management of lateral functional shift of the mandible.

2. Case Presentation

2.1. Anamnesis and Diagnosis

The patient is a 17-year-old woman with a medical history of multiple sclerosis, presenting with aesthetic concerns, including mandibular deviation and crowded dentition.

The facial evaluation revealed a long, oval, asymmetric face with an increased lower third, a right-sided chin inclination, and a resting stomion. The cheekbones were subtle, the nasolabial folds faint, the nasal pyramid appeared flattened, and the bi-commissural line was tilted. The profile was concave, the ANL was straight, and the labial relationship was inverted. The chin was positioned in a transverse-frontal direction, and the cervico-mental distance was increased. Upon examination of the smile, a purely dental smile was observed, with deviations of both the chin and the interincisal midlines relative to the facial midline (**Figure 1(a)**).

Extraoral examination, performed in both the resting position and with manipulation in centric relation (CR), revealed a realignment of the mandibular midline. The chin recenters but remains slightly deviated toward the right (**Figure 1(b)**).

In the intraoral examination, the periodontal biotype was thin, with a marked transverse discrepancy indicated by the deviation of both the maxillary and mandibular midlines, accompanied by an anterior crossbite. Vertically, the patient presented a negative overbite, with an edge-to-edge relationship localized between teeth 21 and 32. Sagittally, a Class I canine relationship was noted on the right side, while a Class III molar relationship was observed on the right, and a Class III canine and molar relationship was present on the left side (**Figure 1(c)**).

Examination in centric relation revealed a premature contact between teeth 13 and 43, along with a reduction in the magnitude of the interincisal midline deviation. Canine and molar relationships were Class II on the right side and Class I on the left (**Figure 1(d)**).

The dental cast analysis showed a normal Bolton index (**Figure 1(e)**).

The functional examination revealed normal nasal ventilation, adult-type swallowing, and alternating unilateral chewing with no phonation abnormalities.

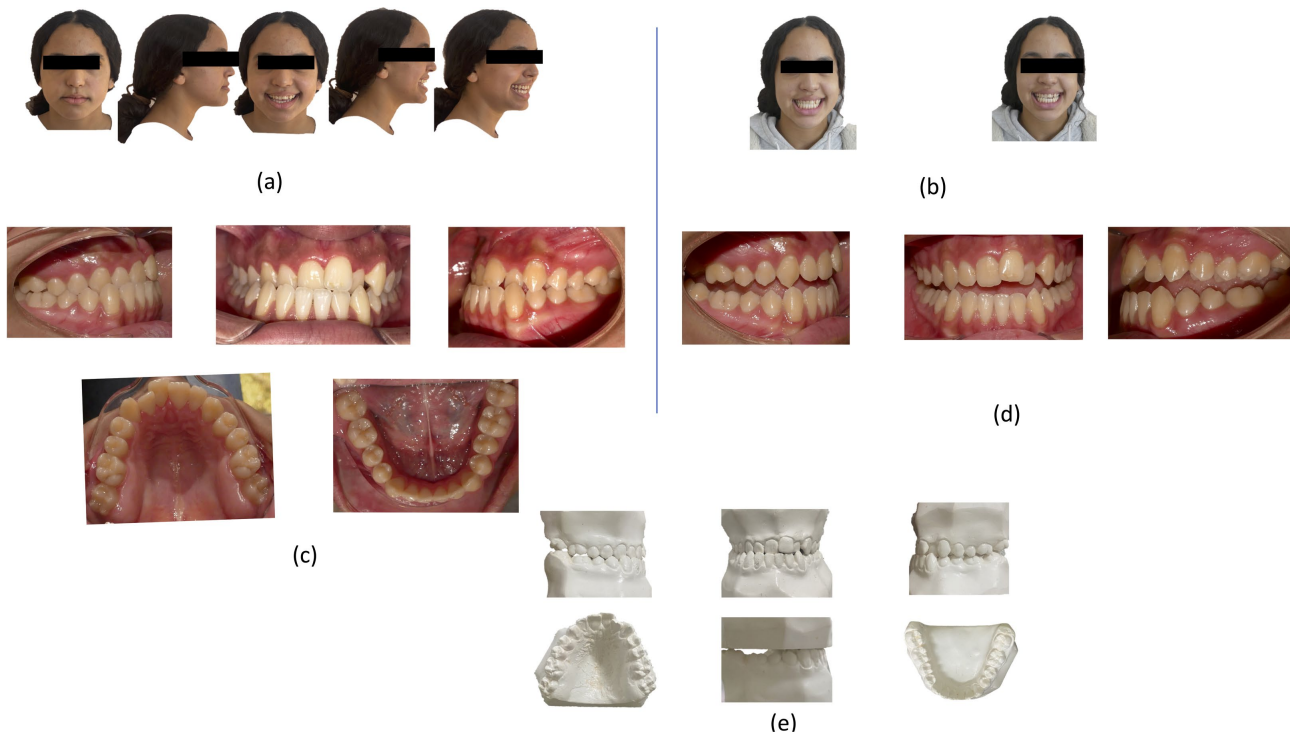


Figure 1. Pretreatment photographs: (a) Extraoral photographs; (b) Extraoral photographs in centric relationship; (c) Intraoral photographs; (d) Intraoral photographs in centric relationship; (e) Dental casts.

The panoramic radiograph showed normal general structures without any particularities, with well-aerated maxillary sinuses and mandibular condyles properly positioned in their glenoid cavities and a horizontal palatal plane.

Regarding the dental formula, it was incomplete due to the absence of teeth 18, 28, 38, and 48. There was parallelism of the roots of all teeth except for teeth 37 and 47, which were in a mesial version (**Figure 2(a)**).

The lateral cephalogram revealed clear upper airways with signs of posterior rotation of the mandible. The maxillary and mandibular incisors were perpendicular to their respective bone bases (**Figure 2(b)**).

The cephalometric analysis indicated that the mandible was in protrusion to the skull base ($SNB = 85^\circ$).

The patient presented a Class III hyperdivergent skeletal relationship ($ANB = -4^\circ$, $AoBo = -4$ mm, $GoGn/SN = 40^\circ$, $FMA = 34^\circ$) (**Table 1**).

Concerning the dental diagnosis, the patient had a lateral functional shift of the mandible and a negative overbite. The canine and molar classifications were as follows: Right canine Class I, right molar Class III, and Left canine and molar Class III.

2.2. Treatment Objectives

The treatment objective was to respond to the patient's complaint related to her

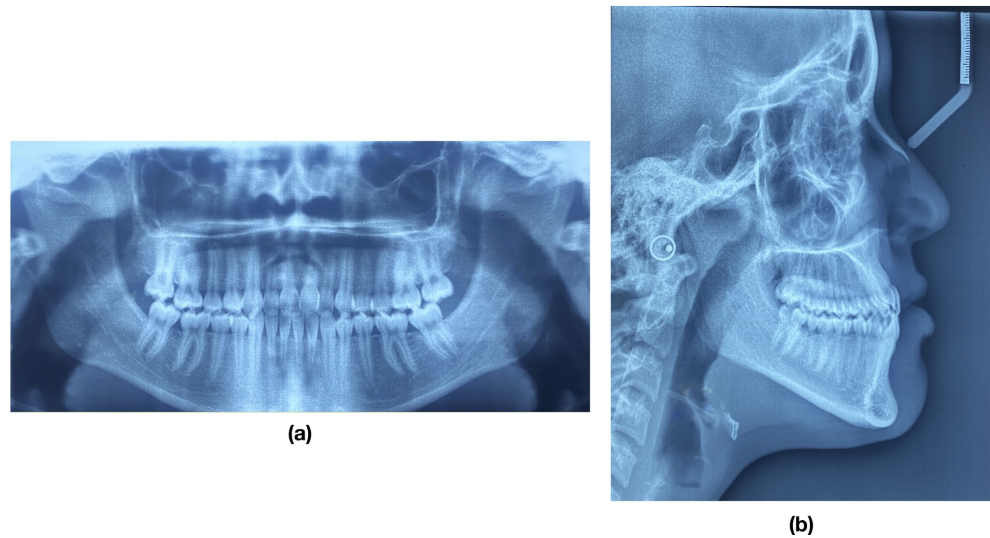


Figure 2. Pretreatment radiographs (a) panoramic radiograph, (b) lateral cephalogram.

Table 1. Cephalometric values according to the Steiner and Tweed analyses, before, during, and after the end of treatment.

		Steiner's analysis		
		Before treatment	During treatment	After treatment
Variable	Objectif			
SNA	82°	81°	84°	85°
SNB	80°	85°	84°	84°
ANB	2°	-4°	0°	1°
SND	76°	83°	83°	83°
I/NA	22°	23°	26°	27°
I/NA mm	4 mm	5 mm	6 mm	6,5mm
i/NB	25°	22°	22°	23°
i/NB mm	4 mm	4 mm	4 mm	4mm
I/i	131°	135°	132°	132°
Pog/NB		3 mm	3 mm	3mm
Occ/SN	14°	15°	15°	15°
GoGn/SN	32°	40°	40°	40°

		Tweed's analysis		
		Before treatment	During treatment	After treatment
Variable	Objectif			
FMA	25° ± 3°	30°	30°	30°
FMIA	67° ± 3°	61°	60°	59°
IMPA	88° ± 3°	89°	90°	90°

Continued

SNA	82°	81	84°	85°
SNB	80°	85	84°	84°
ANB	2° ± 2°	-4°	0°	1°
AoBo	-2mm à +2	-4 mm	1 mm	+2 mm
Upper Lip	/	7 mm	10 mm	11 mm
Total Chin	/	11 mm	11 mm	11 mm
Angle Z	75° ± 5°	78°	78°	77°
Posterior facial height	45 mm	50 mm	50 mm	50 mm
Anterior facial height	65 mm	66 mm	66 mm	66 mm
Index Post/ant	0.69	0.75	0.75	0.75

anterior reverse articulation.

Our objectives were axed on establishing a correct anterior guidance and recentering the mandible. We also aimed to ensure Class I canine and molar relationships, improve the aesthetics of the face and smile, and ensure the long-term stability of the corrections.

Taking into consideration the value of the skeletal base discrepancy, the importance of the functional component, and the potential for compensation of the malocclusion, the therapeutic approach was directed towards an orthodontic treatment without premolar extractions, with a possible genioplasty if needed.

2.3. Treatment Progress

Treatment was initiated with 0.022" × 0.028" edgewise appliance. Initially, the maxilla was bonded. Alignment was first initiated with NiTi arches. Once the teeth were aligned, the transition was made to stainless steel arches, specifically a 16 × 22 on the second row, followed by a 17 × 25 on the third row, on which first-order information was incorporated with an exaggerated offset on the 13. Additionally, an ingress step was incorporated at the level of the 15, which had to be bonded more occlusal.

A recentering of the mandible is observed, with a persistent reverse articulation at the level of the 13 (**Figure 3**).

Next, on a 19 × 25 arch, the offset of the 13 was accentuated, which allowed the reverse articulation to be eliminated. Once the reverse articulation was corrected, the 15 was rebonded, and the mandibular arch was bonded. Since there were no overlaps and the discrepancy was not significant except at the level of the 37, a 16 × 22 NiTi arch was placed directly.

The vestibular version of the mandibular incisors was observed.

Next, the mandibular 7s were bonded, the leveling of the curve of Spee was ensured, and the transition was made to 17 × 25 stainless steel arches, on which omega loops were placed mesially to the canines for Class III elastics (**Figure 3**).

Once the Class III was corrected, second and third-order information was incorporated into the arch, and the prescription for intercuspatation elastics was carried out to allow for better occlusal seating (**Figure 3**).



Figure 3. Set of photographs showing the different stages of the treatment.

2.4. Treatment Results

After 18 months of treatment, brackets were debonded. A fixed retainer wire was placed on both maxillary and mandibular arches.

At the end of orthodontic treatment, the treatment objectives set at the beginning of the treatment were achieved (**Figure 4**).

Since the recentering of the mandible was achieved, the patient was satisfied with her facial aesthetics, and no genioplasty was performed.

Final records showed improved facial aesthetics and a wide pleasant smile with correction of the functional shift of the mandible.

The occlusion relationship, the negative overbite and the midline deviation were corrected (**Figure 4**).

In the panoramic radiograph, dental and periodontal health were maintained. The lateral cephalogram revealed the improvement in facial profile (**Figure 5**).

Cephalometric superimposition demonstrated the enhancement of the lower facial height and the improvement of the interincisal relationship (**Figure 6**).

The patient was monitored for a period of 12 months post-debonding, and stability was maintained without any compromise.

3. Discussion

Dental and facial asymmetries are common chief complaints in orthodontic



Figure 4. Final extraoral and intraoral photographs.

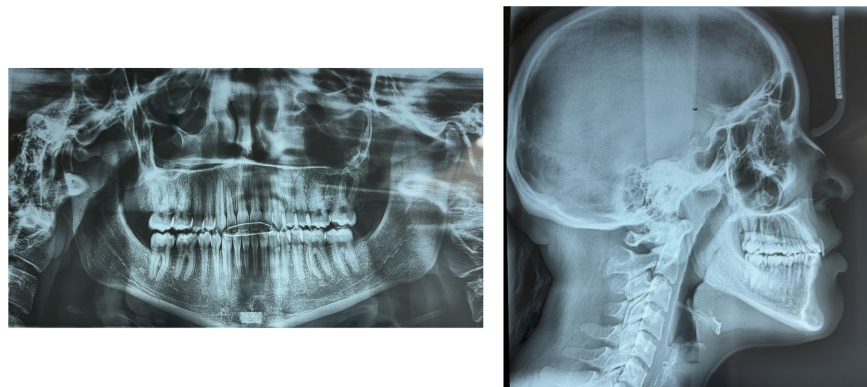
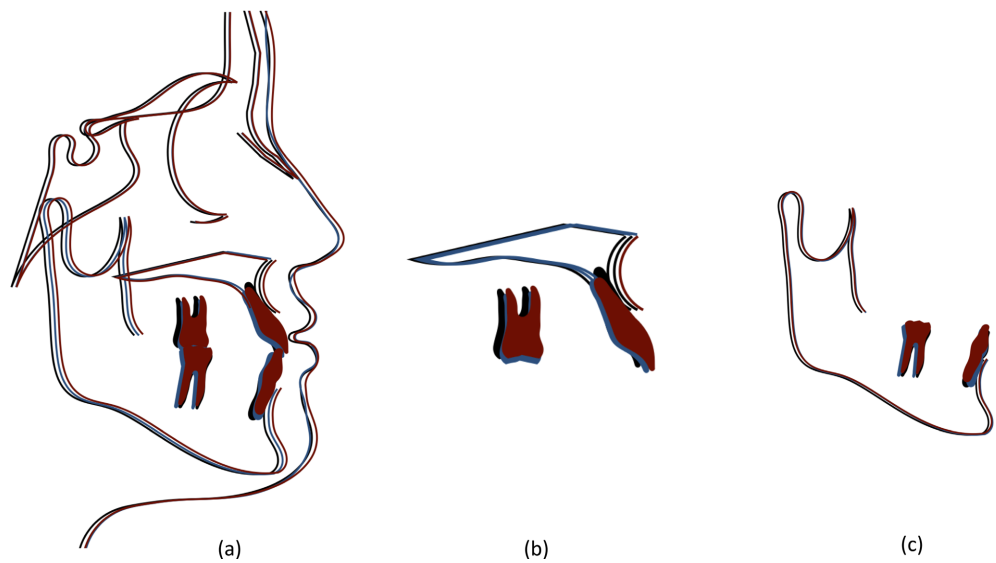


Figure 5. Final radiographs.



Initial (black) and Final (red) cephalometric tracing.

Figure 6. (a) Total superimposition, (b) maxillary superimpositions, (c) mandibular superimpositions.

patients [4]. These issues often involve discrepancies in the alignment of the teeth and jaw, which can affect both the appearance and function of the dentofacial complex. Asymmetries can result from various factors, including skeletal discrepancies, functional deviations, or a combination of both [4] [6].

Functional deviations are typically assessed by observing the alignment of the dental midlines during mouth closure in the maximum intercuspal position, at initial contact, and in the mandibular rest position. Patients with functional deviations often exhibit discrepancies in midline alignment between the initial contact and the point of mouth closure. Since these subtle deviations can be difficult to detect through direct observation, it is necessary to manipulate the patients in centric relation to diagnose them accurately.

The typical clinical manifestations of a functional shift of the mandible are not always readily observed, as they might be compensated by neuromuscular adaptation. The mandible may move into the intercuspal position without interference from the teeth despite the presence of a midline deviation. Tools like the condylar position indicator and mandibular monitoring can assist in identifying abnormal condylar positioning and mandibular movements [5]. However, the dentofacial complex has a remarkable ability to adapt to functional demands, compensating for the shifts over time [4] [5].

Treatment usually involves expanding the maxillary arch to create space, eliminating occlusal interferences, and correcting the functional shift by adjusting the alignment of the jaw. In some cases, the use of occlusal splints or bite blocks may be incorporated to help manage the functional shift and stabilize the jaw position. This approach ensures a balanced occlusion, enhances facial symmetry and helps prevent further complications related to the functional deviations. The treatment plan is tailored to the patient's specific needs, ensuring both functional improvement and aesthetic enhancement [7].

4. Conclusions

Based on the clinical case presented and on the data from the literature, it can be concluded that addressing functional mandibular shifts through orthodontic intervention, including maxillary arch expansion and occlusal adjustments, can lead to satisfactory outcomes.

Additionally, this article aims to equip clinicians with a framework for accurately diagnosing functional deviations, developing treatment plans, and effectively addressing challenges throughout the orthodontic process.

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Ethical Considerations

We obtained verbal informed consent from the patient for the publication of the

results of our work with the scientific community.

Conflicts of Interest

The authors declare no conflicts of interest.

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