

# Non-Surgical Treatment of Class II Division 1 Malocclusion in an Adult Patient with a Missing Lower Lateral Incisor Tooth: A Case Report

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## ABSTRACT

Class II Division 1 malocclusion is clinically more widespread than any other form of malocclusion and can be managed in a variety of ways, taking into account variables such as patient compliance, age, and anteroposterior disparity. Orthodontic camouflage treatment, aimed at masking the underlying skeletal discrepancy, is an acceptable option for most patients. This typically involves the extraction of two maxillary premolars in cases without mandibular arch crowding, or the extraction of two maxillary and two mandibular premolar teeth when crowding is present. The present case report aimed to discuss the successful treatment of a unique case involving a 19-year-old adult female patient with Class II Division 1 malocclusion, a missing mandibular left lateral incisor, and an overjet of 7 mm. Since the patient declined surgical and prosthetic treatment, an alternative, novel, and unorthodox method of camouflage treatment was employed, which involved the extraction of maxillary first premolars combined with symmetrical incisor space closure. The achieved treatment outcomes included a functionally and aesthetically acceptable occlusion, reduced overjet, and an improved soft tissue profile.

**Keywords:** Boltions ratio, Mushroom loop, Orthodontic camouflage treatment

## CASE REPORT

A 19-year-old female patient presented to the postgraduate Clinic of the Orthodontic Department with the chief complaint of upper front teeth protrusion and a gap in the lower left front region. The patient had no significant medical or dental history, except for the loss of the mandibular lateral incisor in the left quadrant due to trauma two years ago.

During extraoral examination, a convex facial profile was observed, with an average clinical Frankfort Mandibular Angle (FMA) of 27°, an acute nasolabial angle of 89°, potentially competent lips, a 4 mm inter-labial gap, and increased display of the incisors. Functional and Temporomandibular Joint (TMJ) examination revealed no abnormalities or abnormal symptoms. Intraoral examination revealed a Class II (End-on) molar and canine relationship, as well as proclined and protruded maxillary anterior teeth. There was approximately 5 mm of space in the lower arch due to the absence of a mandibular left lateral incisor, and an overjet of 7 mm was also noted [Table/Fig-1].



**[Table/Fig-1]:** Pre-treatment extra-oral and intra-oral photographs. Patient profile (lateral-front clinical photograph), Lateral teeth, front teeth photographs, top view photographs. (Images from left upper row to down row right)

Panoramic examination showed no remaining tooth structure and adequate alveolar bone in the area where the mandibular tooth was missing. Cephalometric interpretation indicated a Class II skeletal diagnosis, with the maxilla positioned forward in relation to a normally positioned mandibular skeletal base. The dental parameters revealed proclination of both the upper and lower anterior teeth [Table/Fig-2].



**[Table/Fig-2]:** Pre-treatment cephalogram and Orthopantomogram (OPG).

The arch length-tooth material discrepancy in the maxilla was recorded as 8.3 mm. In the mandible, considering the available space due to the absence of the lateral incisor, a discrepancy of 7.8 mm and an anterior mandibular excess of 1.7 mm were observed. This indicated a need for tooth material reduction (extraction) in both the upper and lower arches if a full set of teeth were present.

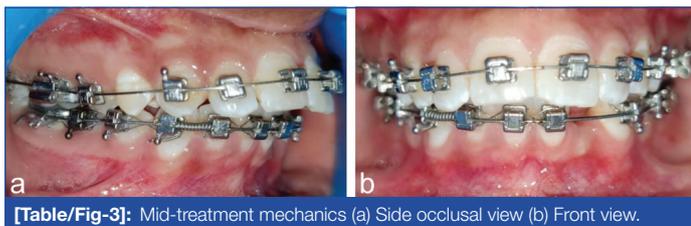
The ideal treatment plan suggested surgical reduction of the maxilla to compensate for its protrusion and fixed/removable prosthetic rehabilitation of the mandibular space. However, the patient declined this option due to the invasiveness of the procedure and financial requirements. Therefore, an alternative treatment strategy was proposed, which involved the extraction of two maxillary first premolars and symmetrical space closure and retraction of the incisor teeth in the lower arch. The patient accepted this alternative treatment plan promptly.

### Treatment objectives

- Correcting the proclination of the maxillary and mandibular anterior teeth.

- Achieve lip competence and improve the nasolabial angle.
- Attain a functionally stable and aesthetically acceptable occlusion.
- Achieve symmetrical positioning of the lower three incisors across the midline.
- Reduce the overjet and establish an adequate overbite.
- Achieve occlusal inter-digitation with Class II molar and Class I canine relation.
- Attain a pleasant soft tissue profile at the conclusion of the treatment.

**Treatment progress:** A pre-adjusted edgewise passive self-ligating fixed orthodontic appliance (0.018 inches) was bonded in both the upper and lower dentition. Second molars were also bonded to provide the necessary anchorage. Levelling and alignment of both arches were achieved using sequential NiTi wires (0.012, 0.014, 0.016, and 0.018) over a period of four months. Subsequently, a 17x25-inch stainless steel archwire was placed in the lower arch and a steel ligature wire was used in a figure-of-8 pattern to consolidate the lower incisor teeth into a single unit. To achieve bilaterally equal space, an open coil spring was placed in the lower right quadrant between the canine and lateral incisor tooth [Table/Fig-3]. Simultaneously, maxillary first premolars were extracted, and a 17x25-inch Titanium-Molybdenum Alloy (TMA) Continuous Mushroom Loop (M-Loop) archwire was placed to initiate en-masse retraction in the upper arch. A greater beta-moment was incorporated into the distal extension of the archwire to counteract anchorage burnout.



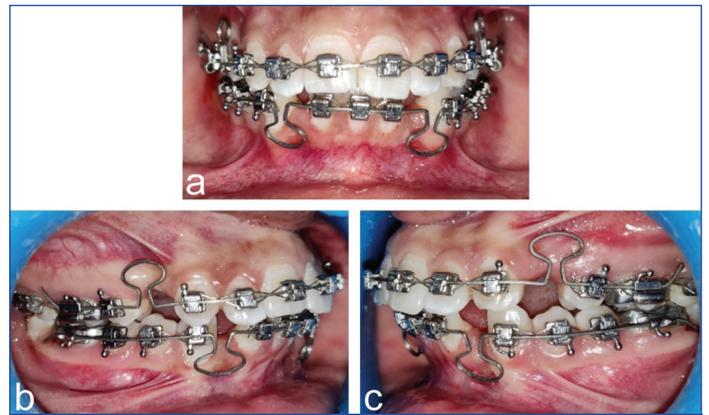
[Table/Fig-3]: Mid-treatment mechanics (a) Side occlusal view (b) Front view.

After three months, an equivalent space of approximately 2.5 mm was achieved on both the lower right and left sides, mesial to the canines. Simultaneously, about 2 mm of retraction of the upper anterior teeth was also accomplished [Table/Fig-4]. Similar to the upper arch, a 17x25-inch TMA Continuous M-Loop archwire was introduced in the lower dentition to achieve symmetrical space closure on the contralateral sides and establish a centered position of the three lower incisor teeth in relation to the mandibular arch [Table/Fig-5]. In the maxilla, the M-Loop was activated by approximately 4 mm (3 mm of pre-activation and 1 mm of additional activation) and was reactivated only after 3 mm of space closure was achieved. Conversely, in the mandible, a single phase of 3 mm activation (2 mm of pre-activation and 1 mm of additional activation) was sufficient for complete bilateral space closure.



[Table/Fig-4]: Mid-treatment intra-oral photographs. a) Right lateral view b) Front view c) Left lateral view d) and e) Top view.

Upon completion of space closure, full thickness 18x25-inch stainless steel archwires were placed in both arches to level the arches and make any necessary third-order corrections. Final detailing was achieved using settling elastics and 0.014-inch stainless steel

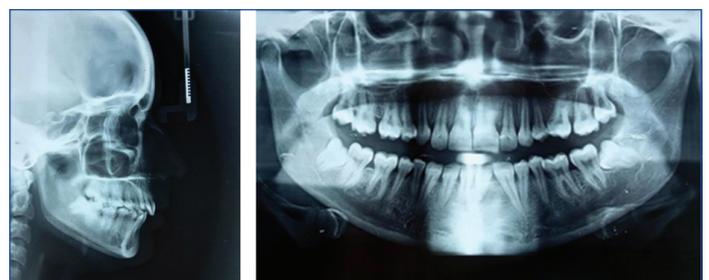


[Table/Fig-5]: Titanium Molybdenum Alloy(TMA) mushroom loop. a) Front view b) and c) lateral view.

archwires. Subsequently, both arches were debonded, and fixed lingual retainers were provided. The patient was instructed to follow a 6-monthly follow-up schedule [Table/Fig-6,7]. Notable skeletal, dental, and soft tissue changes resulting from the orthodontic treatment included a reduction in maxillary prominence, desirable improvement in the skeletal Class II profile, decreased vertical angle, improved angulation and position of the upper and lower anterior teeth in relation to the basal bone, attainment of a Class I canine relationship, and an overall refinement in the arrangement of the upper and lower lips [Table/Fig-8,9].



[Table/Fig-6]: Post-treatment extra-oral and intra-oral photographs. Patient photographs, lateral, front and occlusal teeth photographs and top view teeth photographs. (Images from left upper row to down lower row)

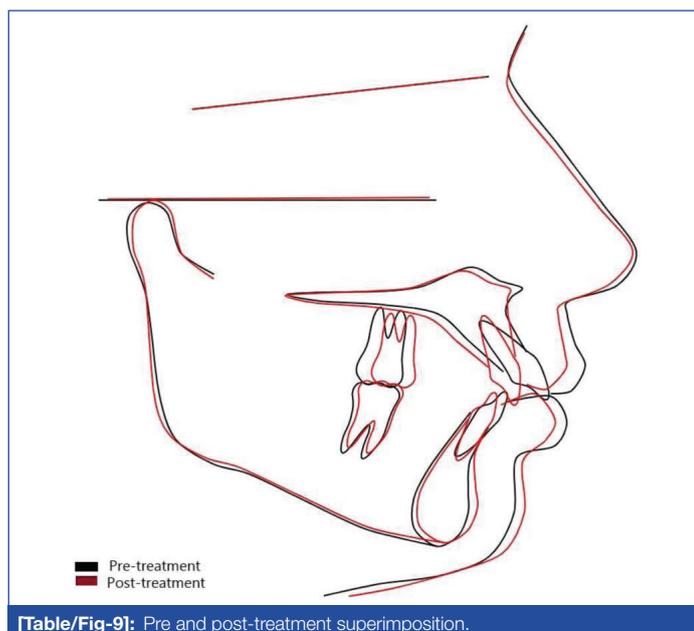


[Table/Fig-7]: Post-treatment cephalogram and Orthopantomogram (OPG).

Measurement	Mean	Pre-treatment	Post-treatment
<b>Skeletal variables</b>			
SNA (°)	82	87	85
SNB (°)	80	81	81
ANB (°)	2	6	4
Wits appraisal (mm)	0	4	3
Go-Gn-SN (°)	32	29	28
<b>Dental variables</b>			
Upper incisor to NA (mm)	4	7	4

Upper incisor to NA (°)	22	35	23
Upper incisor to SN (°)	102	121	104
Lower incisor to NB (mm)	4	7	5
Lower incisor to NB (°)	25	34	27
IMPA-Tweed (°)	90	100	96
Overjet (mm)	2	7	2
<b>Soft tissue variables</b>			
Nasolabial angle (°)	102	89	100
Upper-lip to S-line (mm)	0	+4	+1
Lower-lip to S-line (mm)	-1	+2	0

[Table/Fig-8]: Pre and post-treatment measurements.



[Table/Fig-9]: Pre and post-treatment superimposition.

## DISCUSSION

Patients with Class II malocclusion typically experience physical and psychological challenges due to their condition, making them common candidates for orthodontic treatment. Traditionally, there are two approaches to correcting this malocclusion in post-pubertal individuals: orthognathic surgery or orthodontic camouflage [1,2]. Camouflage therapy for Class II patients requires careful diagnosis and planning, taking into account aesthetic, occlusal, and functional factors [3]. Studies have shown that orthodontic camouflage can lead to fewer functional and temporomandibular joint issues, and patients' satisfaction and perception of outcomes are comparable to those achieved with orthognathic surgery [4].

Different authors have advocated for different extraction sequences for orthodontic camouflage of Class II cases, which may involve extraction of the upper first premolars, lower first or second premolars, or both upper and lower premolars [5,6].

In certain malocclusions, extraction of mandibular incisor teeth can be a viable treatment option if it results in a healthier dentition that is functionally and aesthetically balanced with the surrounding structures [7]. Mandibular incisor extraction is considered when the Bolton tooth size analysis shows a lower anterior excess of 1.1 mm [8]. Class II malocclusion with one or two missing mandibular incisors is rarely reported in the literature [9,10]. This case report presents a similar uncommon clinical situation, complicated by the absence of a mandibular incisor tooth. Considering the presence of a full set of dentition in the patient, the mandibular anterior tooth material showed an excess of 1.7 mm, justifying the reduction of anterior tooth substance. Therefore, our treatment plan involved utilising the available anterior space in the mandible, while fulfilling the space requirements in the maxilla by extracting the maxillary first premolars [11].

Though this orthodontic treatment option has its limitations, such as the potential loss of midline, increased overjet and overbite, and the possibility of affecting anterior guidance and group function [12]. However, the absence of a mandibular dental midline does not appear to have an impact on occlusion, aesthetics, periodontal health, Temporomandibular Joint (TMJ) function, or stability, which are the primary objectives of orthodontic therapy. This is provided that thorough examination of various aspects, including diagnostic criteria, the patient's profile, and skeletal growth trends, is conducted before opting for such a treatment approach [13]. One advantage of space closure in cases of agenesis is the maintenance of permanent biological compatibility of the teeth, along with the preservation of interdental gingival papilla and gingival margins around natural teeth, eliminating the need for prosthetic replacement [14]. Furthermore, patients with missing or extracted mandibular incisor teeth have been reported to exhibit greater stability in the anterior segment compared to premolar extraction cases [15,16]. Additionally, similar degrees of post-treatment relapse and irregularity over time have been observed in both extraction (premolar or incisor) and non-extraction cases [17].

The use of passive self-ligating brackets has improved the overall patient experience and reduced chairside time [18]. The application of the TMA M-Loop archwire allowed for an ideal moment-to-force ratio for bodily retraction of the upper and lower anterior teeth [19]. The mushroom shape of the loop prevented interference with the vestibular or gingival tissues and minimised the chances of loop distortion, resulting in consistent force delivery [20].

## CONCLUSION(S)

The camouflage treatment of Class II Division 1 malocclusion in adults is a consistent challenge for orthodontists, requiring the development of a clinically feasible and functionally stable treatment strategy. The treatment plan discussed and implemented in this case report allowed us to address the patient's primary concern of improving her facial profile, while also reducing the risk of anchorage loss and shortening the treatment duration. It is important to acknowledge that it is not always possible to manage all types of malocclusions symmetrically or achieve a perfect outcome. In certain clinical circumstances, therapeutic goals may need to be modified to meet the specific needs of the patient, even if this means achieving a final result that is less than ideal.

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