

Treatment of a Patient with Class I Malocclusion with Moderate Crowding and Missing First Molar: A Case Report

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ABSTRACT

The most common occlusal feature of Class I malocclusion is crowding. Crowded and irregular teeth occur in a majority of the population and are the most common complication in adults. This is a case report of a 21-year-old woman with moderate crowding and a missing lower left first molar. The first permanent molars are sometimes unnoticed by the child or their parents and bring a risk of caries to the first permanent molar. Caries in the first molars that persist without any treatment will give a poor prognosis. Treatment was performed using a fixed orthodontic appliance with the extraction of the two upper and one lower first premolars.

Keywords: Angle Class I, malocclusion, tooth crowding, tooth loss

INTRODUCTION

More than half (61%) of teenagers aged 13 to 15 years need orthodontic treatment due to a diagnosis of malocclusion Angle Class I.¹ Angle described Class I or neutroclusion as the mesiobuccal cusp of the upper first molar occludes with the mesiobuccal groove of the lower first molar.² The incisor relationship is classed as normal (overjet 2–3 mm). The overall pattern of craniofacial development (short or long face) is established early and on average does not change with age. The features of class I malocclusion could be crowding, anterior open bite, deep bite, and unilateral or bilateral crossbite. The most common occlusal feature of Class I malocclusion is crowding.³

Crowding occurs where there is a discrepancy between the size of the teeth and the size of the arches.⁴ When in a crowded dentition, incisors can erupt lingual and labial to the line of the arch. Rotated and displaced incisors are commonly seen in developing crowded malocclusion.⁵ The amount of crowding present is often classified as mild (< 4 mm), moderate (4–8 mm), and severe (>8 mm). It can be calculated by measuring the mesiodistal widths of any misaligned teeth about the available space in the arch.² The elective extraction of teeth is one method of alleviating crowding.⁴

The first permanent molars are sometimes unnoticed by the child or their parents, and it brings a risk of caries to the first permanent molar. Caries in the first molars that persist without any treatment has a poor prognosis. Decisions about the best options for the management of first permanent molars with poor prognosis can be a challenging and frequent dilemma in general dental practice. The patient's malocclusion will have a bearing on the timing of extraction.⁴

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This article reports on a case of a young adult patient with a malocclusion Angle Class I and Class I skeletal pattern with moderate crowding in the upper and lower arches, with a missing lower left first molar due to caries and extraction of the two upper and one lower first premolars.

CASE REPORT

A 21-year-old woman came to the RSGM-P Orthodontic Department, Faculty of Dental Medicine, Universitas Airlangga with a chief complaint of irregular upper and lower teeth. The patient never had prior orthodontic treatment and wanted to straighten her crowding teeth. Functional analysis and temporomandibular joint (TMJ) examination showed no pain and no clicking. Extraoral examination showed the facial profile to be symmetrical with competent lips, convex face profile, medium face type, mesocephalic head shape, normal speech function, and no bad habits (Figure 1).

Intraoral examination revealed Angle class I molar relationship, with protrusion of the upper left incisor. The overjet was 3 mm and the overbite was 2 mm. The overjet for the right central incisor was -1 mm and for the right lateral incisor was - 3 mm. There was a crossbite on the upper right lateral incisor. The lower left first molar was missing due to caries. Other dentition and periodontium were in good health. The sagittal relationship of the right canine was neutroclclusion, while the left was an edge-to-edge. The patient’s upper dental midline was shifted 1 mm to the right.

The panoramic radiograph showed impaction of the maxilla and mandible of the third molar (Figure 2). The lateral cephalometric analysis revealed the tendention skeletal Class I relationship, in relation to the cranium base with a pattern in the anteroposterior direction between the maxilla and the mandible with a value of ANB 1.5° and analysis of the Wits appraisal of 2.5 mm. The dental inclination of the upper incisors was proclined with a value of \angle I-NA



Figure 1. Pre-treatment facial and intraoral photographs.

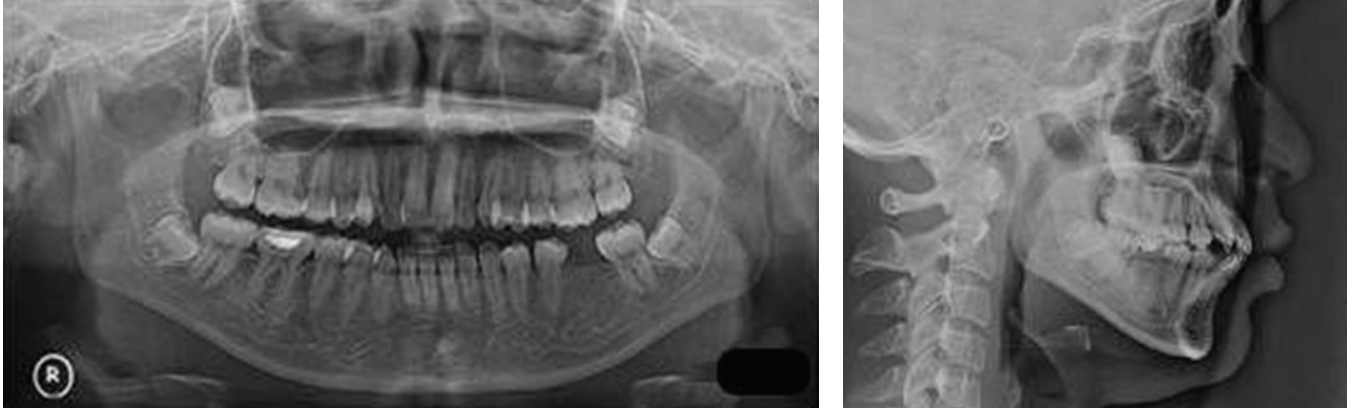


Figure 2. Pre-treatment cephalometric and panoramic radiographs.

31° and the distance between the incisal upper incisor and APog line was 10 mm. The lower incisor's inclination was proclined with a value of \angle I-NB 40° and \angle IMPA 103°. The vertical growth pattern with a value of Y Axis was 71°.

Treatment objectives included correcting the protrusion, relieving maxillary and mandibular crowding, correcting the right incisor crossbite, correcting the shifting midline, correcting the curve of spee, achieving the Class I molar and canine relationship bilaterally, achieving ideal overjet and overbite with ideal arch form in the maxilla and mandible.

Treatment Plan

Based on information gathered from the clinical examination and the diagnostic records, including photographs of the patient's profile and intraoral, dental casts, and radiograph, the treatment plan included relieving the maxillary and mandibular crowding using a fixed appliance with extraction of the first premolar in the upper arch and lower right first premolar. Unilateral premolar extraction of the lower jaw was performed to balance the space created by the missing lower left molar. Oral hygiene was controlled with scaling, extraction of the first premolar, alignment of the upper and lower teeth, retraction of the anterior region, mesialization of the lower left first molar, and retention to achieve tooth and facial stabilization.

Treatment Progress

The molar bands were cemented to the upper first and second molar; lower right first and second molar; and lower left second molar. A 0.022-inch slot MBT (McLaughlin, Bennet, and Trevisi) was preadjusted. Bracket prescription (American Orthodontic) was selected and bonded to the upper and lower arches. Levelling and aligning began with 0.012, 0.014, 0.016 round Nickel-Titanium (NiTi) archwire, 0.016 x 0.016 NiTi, 0.016 x 0.025 NiTi for five months. The next phase was the retraction of the upper canines and lower right canine with the power chain with an additional stop at the mesial of the first molar teeth. The wire used was Stainless Steel (SS) rectangular 0.016 x 0.022. Anterior

retraction of the maxilla and mandible was performed using a T-Loop bent at the wire; the wire used was SS 0.016 x 0.022.

When the retraction phase was completed, the clinician did mesialization of the lower left second molar to achieve a molar class I relationship using elastomeric power chain from the buccal and lingual side. The main archwire was SS 0.016 x 0.022, and the patient's anterior teeth were tied continuously using a metallic ligature acting as an anchorage unit. When the lower left third molar erupted, the molar tube was placed on the tooth. The mesialization phase was continued from the lower left third molar.

Case finishing was performed by upper and lower arch coordination using SS 0.016 x 0.022 wire with the aid of 3/16" heavy force cross elastics on the upper and lower left molars. Finishing and detailing were done using SS 0.017 x 0.025 archwire, with settling with up and down elastics. After 30 months of treatment and getting the ideal occlusion and good function, the fixed orthodontic appliance was removed, and wrap-around retainers were used for stability on both upper and lower arches.

Treatment Results

The profile improved at the end of treatment. Anterior crowding on both upper and lower arches was relieved and there was good alignment. The crossbite on the upper right lateral incisor was also corrected (Figure 3). Class I canine relationships and Class I right molar relationships was achieved. However, a Class II molar relationship was maintained in the left because of unilateral extraction of the lower right first premolar and mesialization of the lower left first molar. The shifting midline and the proclined upper incisors were corrected (Figure 4). A lateral cephalometric radiograph showed changes in dental and soft tissue parameters (Figure 5). The superimposition of the cephalometric showed the upper lip position relative to the E-line improved to the normal value, from 2 mm in front of the E-line to 2.5 mm behind the E-line; for the lower lip, it improved from 4.5 mm in front of the E-line to 1 mm behind the E-line. The upper incisors were protracted



Figure 3. Post-treatment facial and intraoral photographs.

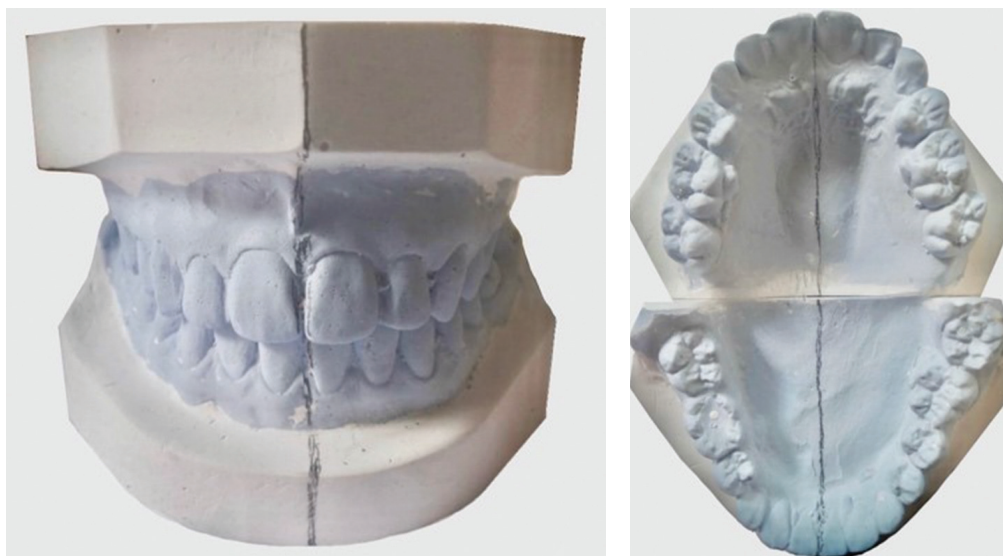


Figure 4. Post-treatment upper and lower dental casts.

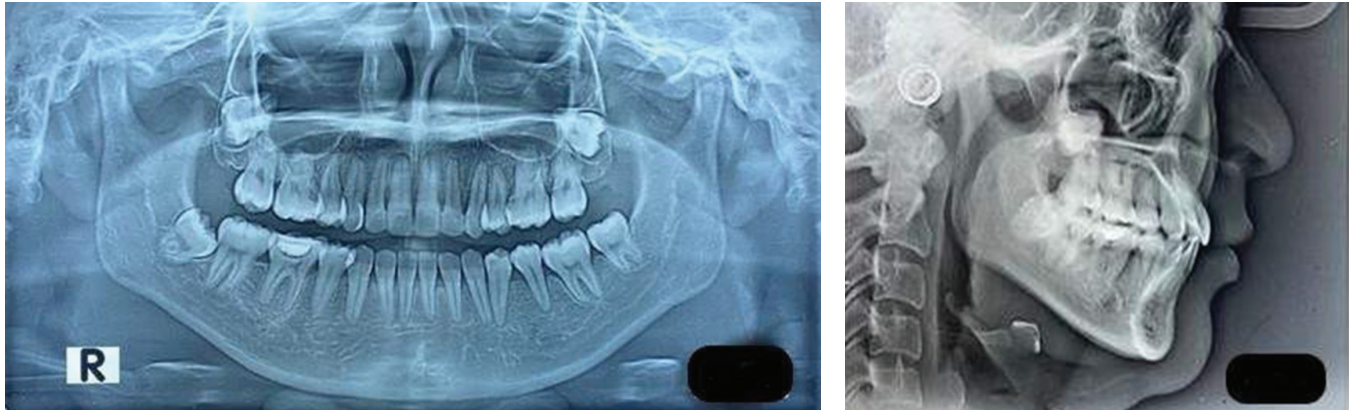


Figure 5. Post-treatment cephalometric and panoramic radiographs.

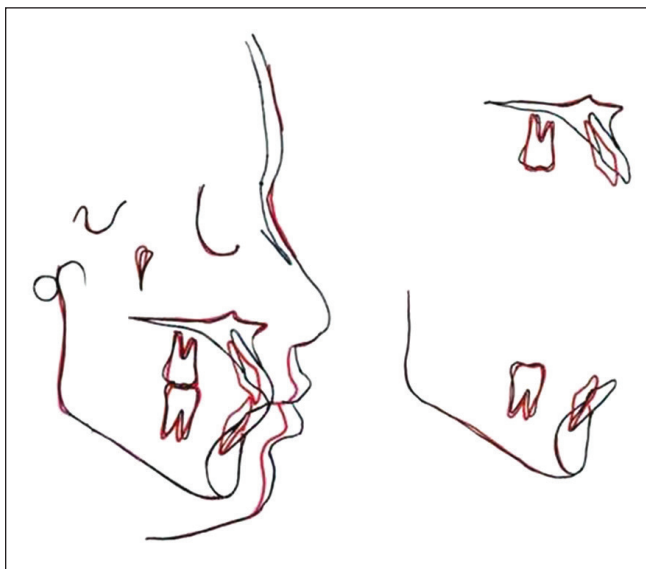


Figure 6. Total and partial superimposition cephalometric pre-treatment (black line) and post-treatment (red line).

in 3 mm, with 25° of labially tipping in relation to the NA line; and the lower incisors were protracted in 3 mm, with 24° of labially tipping in relation to the NB line (Figure 6).

DISCUSSION

The incidence of malocclusion commonly occurs at an equal or greater rate in adults than in children or adolescents. Among all malocclusions, crowding is the most common complication in adults.⁶ Crowded and irregular teeth occur in a majority of the population.⁷ Crowding occurs when there is a discrepancy between the size of the teeth and the size of the arches.⁴ The principles of treatment in Class I malocclusions are relief of crowding; correction of canine relationships; alignment of incisors; space closure; and detailing of the occlusion.³ In this case, the patient presented moderate crowding according to the measurement of the discrepancy

between the tooth size and width of the dental arch on the maxilla and mandible. Premature loss of the upper and lower right central incisor deciduous teeth is thought to cause the palatally-erupted permanent upper right lateral incisor and the shifting upper midline to the right.

Elective extraction of teeth is one method of alleviating crowding. When planning extractions for the management of crowding, we should consider the degree of crowding, usually calculated in millimeters.⁴ Clinicians in the current case have decided to extract the two upper and one lower right first premolar because it had been a space created by the missing lower left first molar. The timing of the first molar extraction and the need to extract the contralateral tooth within the same arch (balancing extraction) are usually the most fundamental orthodontic-related decisions that need to be made.⁴

Anterior crossbite is defined as an abnormal incisor relationship wherein one or more maxillary incisor teeth occlude lingually to the mandibular incisor teeth. This could be due to skeletal or dental origin.⁸ A fixed appliance was chosen to align the teeth to provide space for the right lateral incisor and bring it out of crossbite.

The two-step retraction approach allows retraction of canine teeth independently, followed by retraction of incisors in a second step. This helps to obtain a greater retraction of the anterior teeth by reducing the tendency of anchorage loss by incorporating more teeth in the anchorage unit.⁹ In this case, the clinician used the two-step retraction for the maxillary anterior teeth with sliding mechanics for the canines and frictionless T-loop for retraction of the four incisors. A frictionless spring (loop) requires the determination of both forces and moments at their anterior and posterior ends.¹⁰

When a first permanent molar is lost during childhood or adolescence and not replaced, the second molar drifts mesially and the premolars often tip distally and rotate as space opens between them.⁷ In this case, the lower left second premolar rotated distobuccally due to the space created by the extraction of the lower left first molar. The rotation of the lower left second premolar was corrected during the

leveling and alignment phase. But there will be a need to close the residual spaces by the mesial movement of the second molar, providing more space for the eruption of the third molar. Clinicians used the elastomeric chain from the buccal and lingual side of the second molar, while the anterior teeth were tied continuously using a metallic ligature acting as an anchorage unit. It would be prevented the tipping of the second molar to the residual space. In an article from Livas et al., extraction of the maxillary first molars results in significant uprighting of the second and third molar and facilitates the normal eruption of the third molar.¹¹

Few studies have reported the use of TADs for teeth mesialization with the purpose of dental arch asymmetry correction. The use of TADs, absolute anchorage, has been achieved with optimal orthodontic mechanics.¹² Another case report, a unique clinical treatment procedure with the same case by Wilmes, et al., both maxillary first molars were lost because of periodontitis and nonrestorable decay.¹³ They used direct anchorage, an implant-supported appliance (Mesialslider) to move the maxillary second and third molars.

The lateral cephalometric evaluation showed a significant change in the incisor's inclination of the maxilla and mandible from protrusive to normal. This was due to the use of the 0.016 x 0.022 stainless steel wire, which resulted in torque expression of the brackets. In the maxillary and mandible incisors, a decrease in the $\angle 1 - NA$ line and Incisor Mandibular Plane Angle (IMPA) values on the Tweed's analysis were observed, which means that the upper and lower incisors became more retrusive within normal limits. The change in the inclination of the upper and lower incisors will affect the soft tissue profile with the improvement of lips position relative to the E-line.

Retention is needed after an active phase of orthodontic treatment because there is a tendency to relapse. A wrap-around retainer or the Hawley retainer was used for this patient to maintain tooth alignment and arch width stability. The Hawley retainer is one of the most frequently used retentive appliances available to the clinical orthodontist.¹⁴ Hawley retainers also allow more rapid vertical settling of teeth than vacuum-formed retainers, due to the lack of complete occlusal coverage.²

CONCLUSION

The case showed that Angle Class I malocclusion with moderate crowding and missing lower left first molar treated with the fixed orthodontic appliance gave a good result on the facial profile and occlusion. After treatment, the patient's chief complaints were relieved. Identifying the main cause of the malocclusion and planning proper treatment are key to success and stable orthodontic treatment results.

Acknowledgments

Our gratitude especially to the patient for her approval to allow the case to be published and RSGM-P Faculty of Dentistry, Universitas Airlangga, for their permission to allow the photos to be presented.

Statement of Authorship

All authors contributed in the conceptualization of work, acquisition and analysis of data, drafting and revising and approved the final version submitted.

Author Disclosure

All authors declared no conflicts of interest.

Funding Source

The study has no funding support.

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