

Orthodontic Treatment Of A Skeletal Class II Subdivision Malocclusion With Severe Maxillary Crowding And Midline Discrepancy Using A Straight-Wire Appliance: A Case Report

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Abstract

Background: Skeletal Class II subdivision malocclusion is a challenging asymmetric malocclusion, often associated with severe crowding, dental midline discrepancy, and dentoalveolar and soft-tissue imbalance. Achieving optimal occlusion and facial harmony requires careful management of both space and asymmetry. **Objective:** To report the diagnosis, treatment protocol, and outcomes of straight-wire fixed appliance therapy in a 24-year-old female with skeletal Class II subdivision malocclusion, severe maxillary crowding, and dental midline discrepancy. **Case Report:** A 24-year-old female presented to the Orthodontic Clinic of the Hasanuddin University Dental and Oral Hospital with protrusive and crowded teeth. Clinical examination showed dental midline deviation (maxillary 1 mm left; mandibular 0.5 mm right), overjet 3.5 mm, and overbite 2.5 mm, with a Class II subdivision canine relationship. Model analysis demonstrated a 9-mm maxillary space deficiency. Cephalometric findings indicated skeletal Class II (Class II subdivision) with incisor proclination/protrusion. Treatment was performed using straight-wire fixed appliances (Roth prescription, 0.022-inch slot) with selective extractions and staged mechanotherapy, including leveling and alignment, anterior retraction with T-loops, finishing, and fixed retainer retention. Active treatment lasted from 5 May 2023 to 19 December 2025 (approximately 32 months). Outcomes included improved facial profile, correction of crowding and midline discrepancy, and reduction of overjet to 3.0 mm.

Keywords: Skeletal Class II subdivision malocclusion; Severe maxillary crowding; Fixed orthodontic treatment; Straight-wire appliance; dental midline discrepancy.

INTRODUCTION

Malocclusion is an abnormal relationship between the teeth and jaws that may compromise oral function and facial aesthetics. Class II malocclusion is characterized by sagittal disharmony between the maxilla and mandible, in the class II subdivision variant, the molar and/or canine relationship differs between the right and left sides, resulting in

occlusal asymmetry.¹

Class II subdivision malocclusion in adults is frequently associated with anterior crowding and incisor protrusion, reflecting a mismatch between tooth size and arch length and contributing to dentoalveolar and soft-tissue imbalance.² These features can complicate treatment planning, particularly when space deficiency and midline discrepancy are

present.²

Fixed orthodontic treatment with a straight-wire appliance provides three-dimensional control of tooth movement, enabling correction of crowding, incisor position, and occlusal relationships. In cases with substantial space deficiency, selective extraction may be indicated to facilitate alignment and anterior retraction while aiming for stable and harmonious outcomes.³

This case report describes the fixed appliance management of an adult patient with skeletal Class II subdivision malocclusion accompanied by crowding, and evaluates the clinical and cephalometric changes following treatment.

DIAGNOSIS AND ETIOLOGY

A 24-year-old female patient presented to the Orthodontic Clinic of the Hasanuddin University Dental and Oral Hospital with a chief complaint of protrusive and crowded teeth affecting facial appearance. Extraoral examination revealed a mesoprosopic facial type with a mesocephalic head form, facial asymmetry, a convex profile, competent lips, and normal temporomandibular joint findings.

Intraoral examination showed good oral hygiene and healthy gingiva. The maxillary dental midline was deviated 1 mm to the left and the mandibular midline 0.5 mm to the right. Overjet was 3.5 mm and overbite 2.5 mm; the mandibular curve of Spee was +3.5 mm on the right and +2.5 mm on the left.

The canine relationship was Class II on the right and Class I on the left, consistent with an Angle Class II subdivision pattern.

Study model analysis demonstrated a 9-mm maxillary space deficiency and a 25-mm mandibular space excess; the anterior Bolton ratio was 76%, within the normal range. Howes and Pont analyses indicated maxillary arch constriction, particularly in the premolar and molar regions. Cephalometric analysis supported a skeletal Class II pattern (ANB 5°; Wits AO-BO 6 mm) with incisor protrusion/proclination (IMPA 105°), interincisal protrusion, and a relatively retrusive chin; soft-tissue analysis showed both lips positioned anterior to the E-line and S-line.

Based on these findings, the diagnosis was dentoskeletal Class II subdivision malocclusion with maxillary crowding and anterior dental protrusion;



Fig 1. Initial intraoral photograph before treatment (Source: Personal Documentation)

the etiology was considered multifactorial, including dento-maxillary disharmony and dental factors documented in the case.

TREATMENT OBJECTIVES

The treatment objectives for this case were to: (1) relieve the severe maxillary crowding and achieve well-aligned arches; (2) reduce anterior dental protrusion/proclination and improve incisor position; (3) correct the maxillary and mandibular dental midline discrepancies; (4) normalize the overjet from 3.5 mm to a physiological value and establish an appropriate overbite; (5) level the mandibular curve of Spee and coordinate the arches; (6) correct the Class II subdivision asymmetry to obtain a bilateral Class I canine relationship with functional intercuspation; and (7) improve the soft-tissue profile to achieve a more harmonious facial appearance and a stable, functional occlusion.

TREATMENT ALTERNATIVES

Several treatment alternatives can be considered for an adult patient with skeletal Class II subdivision malocclusion accompanied by severe maxillary crowding and anterior dental protrusion. A non-extraction approach may include fixed orthodontic treatment with limited arch development/expansion and asymmetric Class II mechanics to address the subdivision and midline discrepancy. Another option is an extraction-based approach to obtain adequate space for alignment and controlled anterior retraction; removal of maxillary third molars may be considered when indicated.

In this case, a non-extraction strategy was considered less favorable due to the substantial maxillary space deficiency (9 mm) associated with incisor protrusion and a convex soft-tissue profile. Therefore, straight-wire

fixed appliance therapy with selective extractions (teeth 14, 25, 18, and 28) was selected to provide sufficient space for alignment, facilitate correction of the Class II subdivision and midline discrepancy, and allow controlled anterior retraction to improve facial harmony and occlusal stability.

TREATMENT PROGRESS

Comprehensive fixed orthodontic treatment was planned based on the clinical and radiographic assessment, using a straight-wire appliance combined with selective extractions to create space for alignment and controlled anterior retraction. The treatment plan was explained to the patient and informed consent was obtained. Teeth 18, 14, 25, and 28 were extracted as part of the space-management strategy.

Fixed appliances were placed using the Straight Wire Appliance system with Roth prescription brackets (0.022-inch slot). Molar attachments were secured to establish posterior anchorage, and full bonding was completed to enable three-dimensional control during leveling and space closure.

The initial phase focused on leveling and alignment. Light nickel-titanium (NiTi) archwires were used sequentially (0.014-inch, 0.016-inch, and 0.016 × 0.016-inch) to align the arches while minimizing unwanted tooth movement. Anchorage was reinforced by transitioning to stainless-steel archwires, with cinch-back and auxiliary measures (e.g., mesial stops and tiebacks) to stabilize the posterior segments prior to space closure.

The next phase addressed correction of the Class II subdivision component and maxillary space management. Distalization was

performed in a staged manner with posterior anchorage control, initially distalizing teeth 13 and 24, followed by distalization of 23. This stepwise approach was intended to improve the unilateral Class II relationship and establish a favorable posterior segment position before anterior retraction.

Once the posterior segments were positioned as planned, en masse retraction of the maxillary anterior teeth (12, 11, 21, and 22) was performed on a 0.016 × 0.022-inch stainless-steel working archwire incorporating T-loops. Cinch-back and vertical control bends (including step-up adjustments where needed) were used to maintain arch form, support vertical control, and achieve controlled space closure with appropriate incisor positioning.

In the mandibular arch, non-restorable posterior teeth (47, 46, and 36) were extracted as pre-orthodontic preparation. Leveling and alignment progressed with sequential NiTi archwires and then stainless-steel working archwires. Posterior space management was completed through controlled mesialization, beginning with mesialization of 37 followed by mesialization of 48 and 38 using power chain mechanics on a 0.016 × 0.022-inch stainless-steel archwire with appropriate ligation for anchorage control. Finishing included occlusal adjustments to optimize intercuspation. Active treatment was conducted from 5 May 2023 to 19 December 2025 (approximately 32 months), followed by appliance removal and fixed retainer retention. The patient was referred for prosthodontic rehabilitation of tooth 46.



Fig 2. Intraoral photograph after treatment (Source: Personal Documentation)

Table 1. Cephalometric measurements before and after treatment.

Parameter	Normal (Mean $\pm$ SD)	Pre	Post
Horizontal Skeletal			
SNA ($^{\circ}$)	82 ± 2	83	83
SNB ($^{\circ}$)	80 ± 2	78	78
ANB ($^{\circ}$)	2 ± 2	5	5
Wits appraisal (mm)	1 ± 2	6	5
Convexity angle ($^{\circ}$)	0 ± 5	10	9
Skeletal Vertical			
Y-axis ($^{\circ}$)	59.4 ± 6	64	63
SN–mandibular plane ($^{\circ}$)	32 ± 8	36	35
FMA ($^{\circ}$)	25 ± 3	33	32
Dental Analysis			
U1–NA (mm)	4 ± 2	8	6
U1–NA ($^{\circ}$)	22 ± 6	29	25
L1–NB (mm)	4 ± 2	17	16
L1–NB ($^{\circ}$)	25 ± 7	40	38
Interincisal Angle ($^{\circ}$)	131 ± 6	100	107
Soft Tissue Analysis			
Upper lip E-line (mm)	-2 sampai -3 mm	+3,5 mm	+3 mm
Lower lip E-line (mm)	-1 sampai -2 mm	+4,5 mm	+4,5 mm
Nasolabial angle ($^{\circ}$)	102 ± 8	90°	93°

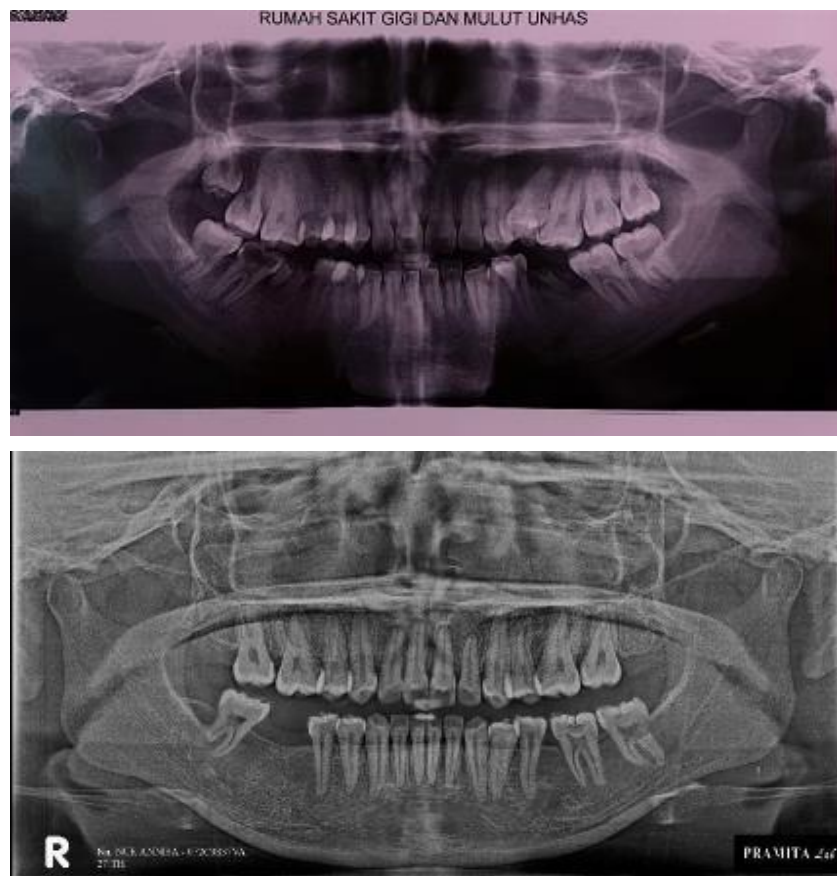


Fig 3. Panoramic radiograph (A) before and (B) after treatment (Source: Personal Documentation)



Fig 4. Lateral cephalogram (A) before and (B) after treatment (Source: Personal Documentation)

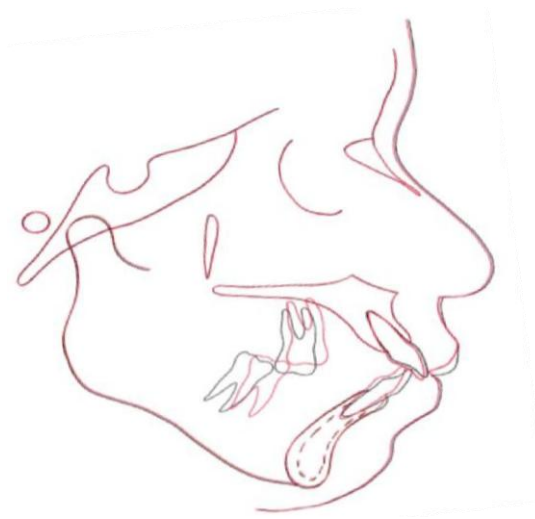


Fig 5. Lateral superimposition before (black line) and after treatment (red line)

DISCUSSION

Skeletal Class II subdivision malocclusion is characterized by a right–left asymmetry in sagittal dental relationships, frequently accompanied by dental midline discrepancies and dentoalveolar compensations. Because the clinical presentation can be driven by different patterns of asymmetry, careful diagnosis is essential to determine whether the discrepancy is predominantly dental, skeletal, or combined, as this directly influences the choice of asymmetric mechanics and the finishing goals.⁴

In the present adult case, the chief complaint was protrusive and crowded teeth. Clinically, the patient exhibited a Class II canine relationship on one side and a Class I canine relationship on the contralateral side, with mild maxillary and mandibular midline deviations. The maxillary arch showed a 9-mm space deficiency, while cephalometric findings were consistent with a skeletal Class II relationship and dentoalveolar protrusion, which contributed to a

convex soft-tissue profile and protrusive lip posture relative to facial reference lines.⁵

Treatment planning for Class II subdivision with clinically meaningful crowding and anterior protrusion commonly involves a choice between non-extraction strategies (arch development and/or incisor proclination) and extraction-based therapy to obtain space while controlling incisor position and soft-tissue outcomes. In this case, a non-extraction approach was considered less favorable because additional proclination could compromise facial esthetics and periodontal limits in an adult. Therefore, selective extraction (including maxillary premolar extraction to gain space and facilitate midline and anterior segment correction) was chosen. Evidence indicates that extraction protocols in Class II subdivision malocclusion—when matched to the asymmetry pattern—can achieve stable occlusal outcomes over the long term, provided that anchorage and finishing

are properly controlled.⁵

A straight-wire fixed appliance system (Roth prescription, 0.022-inch slot) was used, with staged mechanotherapy that included leveling and alignment, asymmetric correction/distalization as indicated, and controlled anterior retraction. Space closure and incisor retraction were assisted by T-loop mechanics on stainless-steel working archwires. Loop-based space-closure concepts allow clinicians to manage the force system more predictably (moment-to-force control) and can be advantageous when precise control of anterior tooth movement is required during retraction.⁶

The clinical outcome showed improvement in alignment and midline discrepancy, with normalization of anterior relationships (overjet reduced from 3.5 mm to 3.0 mm; overbite increased from 2.5 mm to 3.0 mm). Cephalometrically, anterior retraction was reflected by reductions in U1–NA and L1–NB values and an increase in the interincisal angle, while skeletal parameters changed minimally—an expected finding in adult camouflage treatment. Soft-tissue improvement (including more favorable lip position and a modest increase in the nasolabial angle) is consistent with broader evidence that extraction-based treatment in adults tends to produce greater, albeit variable, soft-tissue profile changes compared with non-extraction therapy.⁷

An additional clinical consideration in this case was the presence of compromised posterior teeth and the need for restorative rehabilitation. Adult patients with missing or severely decayed first molars often require coordinated orthodontic–restorative planning, including decisions about whether to close spaces orthodontically or maintain/open space for prosthodontic replacement, while

also accounting for anchorage demands and long-term function.⁸

Retention remains critical, particularly for adult patients and cases involving correction of anterior irregularities and midlines. Fixed retainers were selected to support long-term alignment maintenance. Current evidence syntheses comparing bonded retainers and vacuum-formed retainers suggest that both can maintain stability, with differences influenced by study design, risk of bias, periodontal considerations, and appliance failures—reinforcing the need for individualized retention planning and periodic follow-up.⁹

Overall, this case supports that fixed appliance therapy with a straight-wire system, selective extractions, and carefully planned biomechanics can successfully address severe maxillary crowding and Class II subdivision asymmetry in an adult patient, while improving both occlusal relationships and soft-tissue harmony. As with all single case reports, the findings should be interpreted cautiously, and longer follow-up is recommended to document stability and periodontal response during retention.

CONCLUSION

Managing adult skeletal Class II subdivision malocclusion with severe maxillary crowding and anterior protrusion requires careful diagnosis and individualized mechanics. In this case, selective extractions combined with straight-wire fixed appliances provided sufficient space for alignment, supported controlled anterior retraction and midline correction, and improved facial harmony. Treatment planning should balance occlusal goals with soft-tissue considerations and retention to support long-term stability.

Acknowledgement

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Conflict of Interest

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