



Case Report

Management of bimaxillary dentoalveolar protrusion with positive lip step using tad-supported anchorage and adjunctive platelet-rich plasma: A case report

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Abstract

Introduction: A young adult patient presented with skeletal Class I relationship (ANB within normal limits) and Angle Class I molar-canine occlusion, accompanied by positive lip step due to bimaxillary dentoalveolar protrusion.

Aim: The primary aim is to achieve a stable Class I occlusion with ideal overjet/overbite, relieve anterior crowding, correct midline deviation and facial asymmetry, and establish lip competence through dentoalveolar camouflage in this post-pubertal hyperdivergent patient and improve soft tissue profile by retracting protrusive lips, reducing 4 mm interlabial gap and positive lip step, while enhancing smile consonance and nasolabial angle.

Results: Class I molar relationship was maintained with correction of positive lip step and improvement in facial profile.

Conclusion: This case report highlights the effective treatment of bimaxillary dentoalveolar protrusion with a positive lip step in a skeletal Class I hyperdivergent adult patient using TAD-supported anchorage and adjunctive PRP.

Keywords: Positive lip step, PRP, TADS

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1. Introduction

In orthodontic diagnosis, the Korkhaus lip step analysis evaluates the sagittal position of the lower lip relative to the upper lip. A positive lip step, characterized by anterior positioning of the lower lip, is commonly associated with mandibular prominence or skeletal Class III tendencies. In contrast, patients with skeletal Class I relationships typically demonstrate a harmonious anteroposterior jaw relationship. However, in rare instances, soft-tissue discrepancies may present as a positive lip step despite underlying skeletal harmony. Such variations may arise due to factors including lip strain, bimaxillary dental protrusion, altered lip tonicity, or measurement variability.¹

This report focuses on an uncommon presentation in which a positive Korkhaus lip step was observed in a skeletal Class I patient exhibiting straight facial divergence and a straight profile. The persistence of this atypical soft-tissue profile may be attributed to hyperdivergent growth patterns or subtle vertical maxillary excess, which can permit anterior eversion of the lower lip. In these cases, overall skeletal harmony may mask underlying dental compensations. Previous studies have reported a higher prevalence of positive lip step findings in skeletal Class I patients within Asian populations (approximately 15–20%) compared with Caucasian populations (<10%).²

Mini-screw-assisted anterior retraction using sliding mechanics is a well-established and widely accepted

orthodontic treatment modality for managing skeletal Class I patients with bimaxillary protrusion. This approach facilitates posterior movement of the anterior dentition to correct dental protrusion, relieve crowding or spacing, and improve both occlusal relationships and facial esthetics. Temporary anchorage devices (TADs) provide absolute anchorage, thereby eliminating undesirable reciprocal tooth movement during anterior retraction. Their use allows controlled en-masse retraction of the anterior segment with minimal or no posterior anchorage loss, which is particularly advantageous in high-anchorage cases such as bimaxillary protrusion and hyperdivergent growth patterns.² Force application from TADs using nickel–titanium closed-coil springs or active tie-backs delivers consistent and predictable force systems, enabling bodily tooth movement and enhanced vertical control during space closure. Mini-screw-assisted retraction has demonstrated high clinical success, offering precise control over tooth movement while improving treatment efficiency and predictability. This biomechanics-driven approach significantly contributes to improvements in facial profile, smile esthetics, and functional occlusion.

In addition to biomechanical control, biological modulation was achieved through the adjunctive use of platelet-rich plasma (PRP). PRP is an autologous concentrate of platelets suspended in plasma and contains a high concentration of growth factors, including platelet-derived

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growth factor (PDGF), transforming growth factor- β (TGF- β), and vascular endothelial growth factor (VEGF). These bioactive mediators enhance angiogenesis, increase osteoclastic activity, and accelerate periodontal ligament turnover, thereby facilitating orthodontic tooth movement. Local PRP injections administered adjacent to extraction sites or within the surrounding mucosa have been shown to stimulate bone remodeling, accelerate space closure, and reduce healing time. PRP has been reported to be particularly effective during canine retraction, space closure, and en-masse anterior retraction.³ The combined use of TADs and PRP in this case incorporated both precise biomechanical control and a biologic adjunct; however, the specific contribution of PRP to treatment efficiency and outcomes cannot be determined from a single case. While TADs provide stable anchorage and controlled force delivery, PRP has been suggested to influence the regional acceleratory phenomenon (RAP); however, its effect on the rate of orthodontic tooth movement and overall treatment duration remains inconclusive in clinical settings. This combined approach may also improve periodontal response and patient comfort, making it a valuable adjunctive strategy in contemporary orthodontic practice. adjunct in the management of bimaxillary protrusion cases.⁴ PRP was used as an adjunctive biologic modality; however, its specific contribution to treatment efficiency and tissue response cannot be determined from this single case. Although PRP has been suggested to influence bone remodeling, conclusive clinical evidence in orthodontics remains limited.

2. Case Report

2.1. Diagnosis

A 19 year old female patient came with the chief complaint of a irregularly placed upper and lower front teeth since 4 years. No relevant medical, dental, or prenatal/natal/postnatal history was reported. Clinical examination revealed having straight profile and straight divergence with positive lip step. Patient had Skeletal Class I Jaw bases with retrognathic maxilla and retrognathic mandible ($ANB=1^\circ$) with Hyperdivergent growth pattern on account of J. Ratio 63%with CVMI Stage VI (Completion) with 0 % growth remaining, Patient has Angle's Class I Deweys type 2 Malocclusion, Overjet of 3 mm and an overbite of 4 mm with non-consonant smile, functionally/potentially incompetent lips, 4 mm Interlabial gap and normal nasolabial angle, Normal TMJ Bolton max. overall excess (1.85) Soft tissue analysis showed an protusive lips Upper lip to S line(Patient) = +4 mm and Lower lip to S line(Patient) = + 9mm E line- -3 mm (UPPER lip), mm + 6mm (lower lip).



Figure 1: Pretreatment extraoral and intraoral photographs

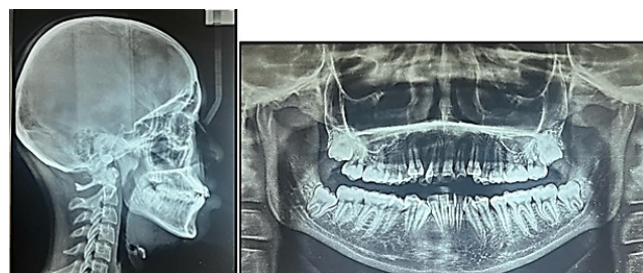


Figure 2: Pretreatment radiographs

Table 1. Pretreatment cephalometric values

Variables	Pre-treatment value
SNA	77
SNB	76
ANB	1
Wits Appraisal	-1 mm
S-N to Maxillary Plane	6
MPA	38
MMPA	35
Upper Incisor to Maxillary Plane	54
Upper Incisor to S-N Plane	120°
Lower Incisor to Mandibular Plane	95
Lower Incisor to A- Pog	7 mm
Inter- Incisal Angle	115
Lower Incisor Edge to Upper Incisor Root Centroid	-2mm
Nasolabial Angle	104
Upper Lip to E- Plane	-3 mm
Lower Lip to E- Plane	+7mm
UAFH	42 m
LAFH	58mm
AFH	101mm
PFH	64 mm
Jarabak Ratio	63%

3. Treatment Objectives

1. To correct inclination of upper teeth
2. To correct inclination of lower teeth
3. To correct positive lip step To correct midline shift
4. To achieve normal Overbite
5. To maintain Class I molar relationship.

3.1. Treatment plan

After obtaining informed consent. Phase 1 was started with bonding of upper arch with pre-activated Edgewise brackets (.022"x .028") slot. Bands were placed on all 1st permanent molars. Initial leveling and alignment were carried out

using 0.014" NiTi archwires, followed by 0.016" and 0.018" NiTi archwires. Following alignment, indicated extractions were performed and arch consolidation was achieved. For anchorage reinforcement, titanium mini screws (diameter 1.5mm, length 8mm, SK Surgical) (Figure 3) were inserted under local anesthesia in the interradicular space between the maxillary first permanent molar and second premolar at the height of mucogingival junction in (Figure 3). The implants were placed at least one week before the PRP injection to reduce the effect of mechanical stress on bone metabolism. The patient was advised to keep the micro-implant clean by gently using interdental brush



Figure 3: Mini implant placed between second premolar and 1st molar

After 1 week of implant insertion. PRP preparation was done under aseptic processing procedure by double spin technique. PRP method as described by Liou61 was used in (Figure 4).

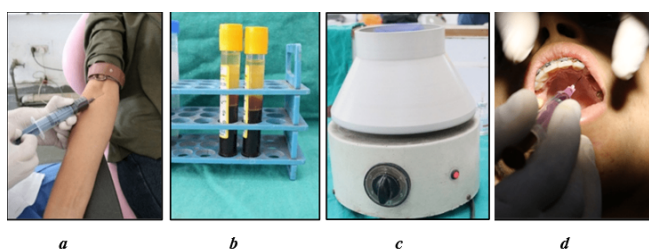


Figure 4: a) Collection of blood b) blood collected in ACD tubes c) Centrifugation d) Injecting PRP under 1000 rpm for 12 minutes-PRP was injected on distal aspect of canine

Individualised canine retraction was then started on 0.018"×0.025" SS wire using calibrated nickel-titanium closed-coil springs with 150 gm of force on each side following the injection of PRP on the intervention side.

Following segmental canine retraction, En-masse retraction of the anterior segment was carried out. Orthodontic force application from the temporary anchorage device (TAD) was discontinued, and reverse bracket bonding with respect upper right lateral incisor was done. A 0.012" nickel-titanium (NiTi) auxiliary archwire was placed in the auxiliary slot in both the maxillary and mandibular arches, while the 0.018 × 0.025-inch stainless steel working archwire was re-ligated. In the mandibular arch, an AJ Wilcock 0.018-inch stainless steel wire was continued with stop bends, and orthodontic forces were maintained on the left side. Space closure, consolidation, and finishing were completed with periodic re-ligation and controlled force adjustments until optimal alignment, root parallelism, arch coordination, and a satisfactory occlusal relationship were achieved.



Figure 5: Individual canine retraction

4. Results

Post-treatment records showed significant improvement in the facial profile, with conversion of the initial positive Korkhaus lip step into an almost straight lip step through TAD-supported anterior retraction and extraction space closure, similar to the mini-screw-assisted bimaxillary protrusion corrections reported by Lin and Liou, Villela and co-workers, and other clinicians using skeletal anchorage for full-arch retraction in Class I patients. The controlled reduction in maxillary and mandibular incisor proclination decreased lip protrusion and the interlabial gap, thereby improving sagittal lip position in line with soft-tissue changes described by investigators evaluating lip profile changes after incisor retraction. Class I molar and canine relationships were maintained, midline discrepancy was corrected, and well-aligned arches with proper overjet and overbite were achieved, reflecting the stable occlusal and esthetic outcomes commonly reported in TAD-assisted bimaxillary dentoalveolar protrusion case reports. The adjunctive use of platelet-rich plasma appeared to support smooth orthodontic tooth movement and satisfactory tissue healing. Overall, both functional and esthetic treatment objectives were successfully achieved, resulting in a stable and pleasing outcome.



Figure 6: Posttreatment extraoral and intraoral photographs

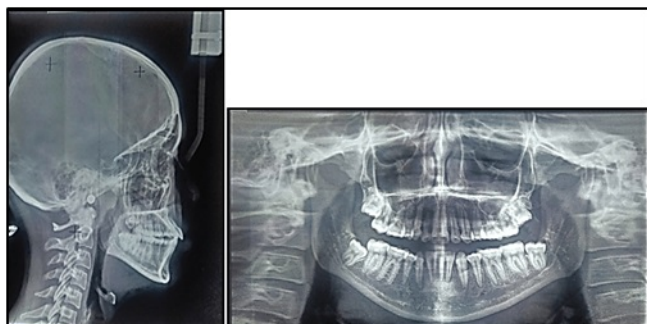


Figure 7: Posttreatment radiographs



Figure 8: Superimpositions

Table 2. Comparison between pre and Post treatment cephalometric values

Variables	Pre Treatment Value	Post Treatment Value
SNA	77	77
SNB	76	76
ANB	1	1
Wits Appraisal	-1	-1
S-N to Maxillary Plane	6	4
Mandibular Plane Angle	38	37
MMPA	35	35
Upper Incisor to Maxillary Plane	54	50
Upper Incisor to S-N Plane	120	114
Lower Incisor to Mandibular Plane	95	92
Lower Incisor to A- Pog	7	5
Inter- Incisal Angle	115	112
Lower Incisor Edge to Upper Incisor Root Centroid	-2	-1
Nasolabial Angle	104	114
Upper Lip to E- Plane	-3	-1
Lower Lip to E- Plane	7	5
UAFH	41	41
LAFH	58	58
AFH	101	99
PFH	64	63
Jarabak Ratio	63	63.6

5. Discussion

The case involves a skeletal Class I patient with significant bimaxillary dentoalveolar protrusion and a positive Korkhaus lip step—characterized by lower lip protrusion relative

to the upper lip line—despite a straight facial profile, primarily due to proclined incisors in both arches combined with a hyperdivergent growth pattern. This dental compensation caused upper and lower lip procumbency and an increased interlabial gap, creating an illusion of mild convexity without true sagittal skeletal discrepancy. An extraction-based camouflage protocol addressed the dentoalveolar component: following removal of all four first premolars, controlled anterior retraction was achieved via mini-screw-supported individualized canine-then-incisor mechanics, with temporary anchorage devices positioned between the maxillary first molar and second premolar for near-absolute anchorage, preventing posterior mesial movement. This biomechanics enabled efficient incisor repositioning, substantial lip retraction, interlabial gap reduction, and conversion of the positive Korkhaus lip step to a straight profile, aligning with outcomes reported by Lin and Liou (2020)⁵, who achieved upper incisor retraction and intrusion with miniscrew anchorage, alongside mandibular autorotation for profile enhancement. Similar soft-tissue improvements, including nasolabial angle widening and lip competency, were noted by Sharma et al. (2010)⁶ in lingual orthodontics, and more recent cases like those by Beyling F (2021)⁷ using en-masse distalization.

Adjunctively, platelet-rich plasma (PRP) was applied via Liou's (2016)⁸ submucosal injection protocol with double-spin preparation to accelerate space closure through the regional acceleratory phenomenon (RAP), enhancing osteoclastic activity. Experimental animal studies by Güleç (2017)⁹ demonstrated 1.7-fold faster tooth movement with high-concentration PRP, while Akbulut (2018)¹⁰ and Tehranchi et al. (2019)¹¹ confirmed transient acceleration in canine retraction models. However, human clinical evidence during mini-screw-assisted en-masse retraction is equivocal: Chandak and Patil (2021)¹² found no significant differences in retraction rates or anchorage control in adult Class I bimaxillary protrusion patients, despite minor postoperative discomfort. Systematic reviews by Arqub et al. (2021),¹³ and recent trials like Al-Bozaie et al. (2024)¹⁴ further highlight inconsistencies due to methodological heterogeneity, small sample sizes, and negligible overall effects in comprehensive orthodontic protocols.

6. Conclusion

This case report demonstrates the successful management of bidental protrusion associated with a positive Korkhaus lip step in a skeletal Class I hyperdivergent adult patient using extraction-based camouflage supported by temporary anchorage devices (TADs) and adjunctive platelet-rich plasma (PRP).

Mini-screw-assisted mechanics provided effective absolute anchorage, enabling controlled anterior retraction, preservation of the Class I molar relationship, correction of midline deviation, normalization of overjet and overbite, and significant improvement in facial profile. The positive lip step was successfully converted to an almost straight lip relationship, with reduction in lip protrusion and interlabial gap, resulting in enhanced lip competence and improved smile esthetics.

“Platelet-rich plasma (PRP) was used as an adjunctive biologic modality; however, its specific contribution to treatment efficiency and tissue response cannot be isolated in this single case

Overall, the combined biomechanical and biological approach proved effective in achieving stable functional occlusion and harmonious soft-tissue balance in a non-growing adult patient with bimaxillary dentoalveolar protrusion.

7. Source of Funding

None.

8. Conflict of Interest

None.

References

- Joshi M, Wu LP, Maharjan S, Regmi MR. Sagittal lip positions in different skeletal malocclusions: a cephalometric analysis. *Prog Orthod*. 2015;16:8. <https://doi.org/10.1186/s40510-015-0077-x>
- Lin SY, Yu KW, Lai TT, Liu CJ, Hsu LF. Orthodontic correction of bimaxillary protrusion with mini-screws in Class II hyperdivergent patient. *Taiwan J Orthod*. 2019;31(2):115–26.
- Yao K, Wang L, Sun L. The effect of platelet-rich concentrates on orthodontic tooth movement: a systematic review and meta-analysis. *Heliyon*. 2022;8(9):10604. <https://doi.org/10.1016/j.heliyon.2022.e10604>
- El-Timamy A, El Sharaby F, Eid F, El Dakrouy A, Mostafa Y, Shaker O. Effect of platelet-rich plasma on the rate of orthodontic tooth movement: a split-mouth randomized trial. *Angle Orthod*. 2020;90(3):354–61. <https://doi.org/10.2319/072119-483.1>
- Lin LY, Chang CH, Roberts WE. Bimaxillary protrusion and gummy smile treated with clear aligners: Closing premolar extraction spaces with bone screw anchorage. *APOS Trends Orthod*. 2020;10(2):120–31. https://doi.org/10.25259/APOS_45_2020
- Sharma JN. Skeletal and soft tissue point A and B changes following orthodontic treatment of Nepalese Class I bimaxillary protrusive patients. *Angle Orthod*. 2010;80:91–6. <https://doi.org/10.2319/010409-6.1>
- Beyling F, Klang E, Niehoff E, Schwestka-Polly R, Helms HJ, Wiechmann D. Class II correction by maxillary en masse distalization using a completely customized lingual appliance and a novel mini-screw anchorage concept - preliminary results. *Head Face Med*. 2021;17(1):23. <https://doi.org/10.1186/s13005-021-00273-3>
- Liou EJ. The development of submucosal injection of platelet rich plasma for accelerating orthodontic tooth movement and preserving pressure side alveolar bone. *APOS Trends Orthod*. 2016;6(1):5–11. <https://doi.org/10.4103/2321-1407.173725>
- Güleç A, Bakkalbaşı B, Cumbul A, Uslu Ü, Alev B, Yarat A. Effects of local platelet-rich plasma injection on the rate of orthodontic tooth movement in a rat model: a histomorphometric study. *Am J Orthod Dentofac Orthop*. 2017;151:92–104. <https://doi.org/10.1016/j.ajodo.2016.05.016>
- Akbulut S, Yagci A, Yay AH, Yalcin B. Experimental investigation of effects of platelet-rich plasma on early phases of orthodontic tooth movement. *Am J Orthod Dentofac Orthop*. 2019;155(1):71–9. <https://doi.org/10.1016/j.ajodo.2018.03.015>
- Tehranchi A, Behnia H, Pourdanesh F, Behnia P, Pinto N, Younessian F. The effect of autologous leukocyte platelet rich fibrin on the rate of orthodontic tooth movement: A prospective randomized clinical trial. *Eur J Dent*. 2018;12(3):350–7. https://doi.org/10.4103/ejd.ejd_424_17
- Chandak SS, Patil AS. Effect of platelet-rich plasma on the rate of orthodontic tooth movement. *Am J Orthod Dentofac Orthop*. 2022;162(1):e28–e34. <https://doi.org/10.1016/j.ajodo.2022.03.013>
- Arqub SA, Gandhi V, Iverson MG, Ahmed M, Kuo CL, Mu J. et al. The effect of the local administration of biological substances on the rate of orthodontic tooth movement: a systematic review of human studies. *Prog Orthod*. 2021;22(1):1–5. <https://doi.org/10.1186/s40510-021-00349-5>
- Al-Bozaie MW, Baba F, Hajeer MY. An Evaluation of the Rate and Type of Orthodontic Tooth Movement When Injecting Platelet-Rich Plasma During Mini-Implant-Based Segmented en-Masse Retraction of Upper Anterior Teeth. *Cureus*. 2024;16(6):e62368. <https://doi.org/10.7759/cureus.62368>

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