Case Report

DOI: 10.7860/JCDR/2026/80716.23268

Orthodontic Correction of Vertical Maxillary Excess using Mini-implants: A Case Report

Dentistry Section

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ABSTRACT

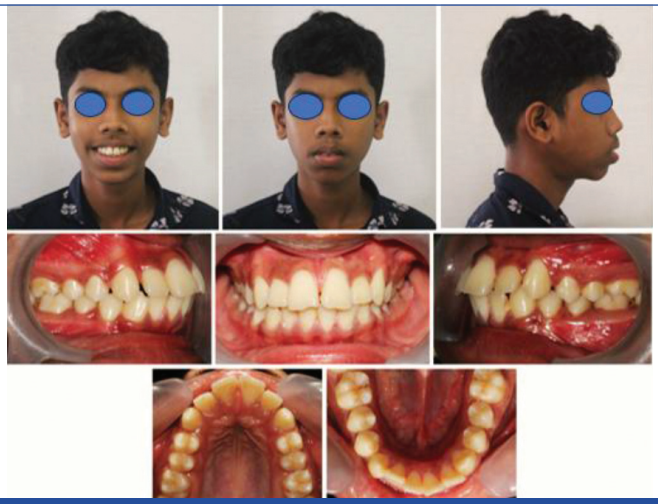
Vertical Maxillary Excess (VME) is a complex skeletal anomaly frequently linked with long-face syndrome and characterised by excessive incisor visibility, lip incompetence, and aesthetic disharmony. This case report outlines the successful orthodontic management of a 14-year-old male presenting with skeletal Class II malocclusion, vertical maxillary excess, and bimaxillary protrusion. The treatment strategy integrated mini-implant-supported intrusion and en-masse retraction following the extraction of all first premolars. Three titanium mini-implants were employed—one midline and two inter-radicular mini-implants in the molar region—for effective anterior intrusion and posterior retraction using absolute anchorage, minimising patient compliance requirements. Cephalometric analysis revealed notable skeletal and dental improvements, including a 3° reduction in Sella-Nasion to Point A angle (SNA), normalisation of the A point-Nasion-B point angle (ANB) to 2°, a decrease in the upper incisor to nasal floor distance (U1-NF) from 36 mm to 33 mm, and a 4° reduction in the Frankfort Mandibular Plane Angle (FMA), indicating favourable mandibular autorotation. These changes contributed to improved smile aesthetics, profile balance, and incisor display. The treatment was concluded with Hawley's retainers. This case highlights the efficacy of mini-implants in addressing VME with minimal invasiveness, offering predictable results and high patient satisfaction.

Keywords: Dental anchorage, Dental malalignment, Skeletal vertical discrepancy, Temporary anchorage device

CASE REPORT

A 14-year-old male reported with the chief complaint of protruding upper front teeth and excessive display of the upper anterior teeth while smiling. Relevant dental history, oral habits, and medical history were reviewed; no significant findings were reported.

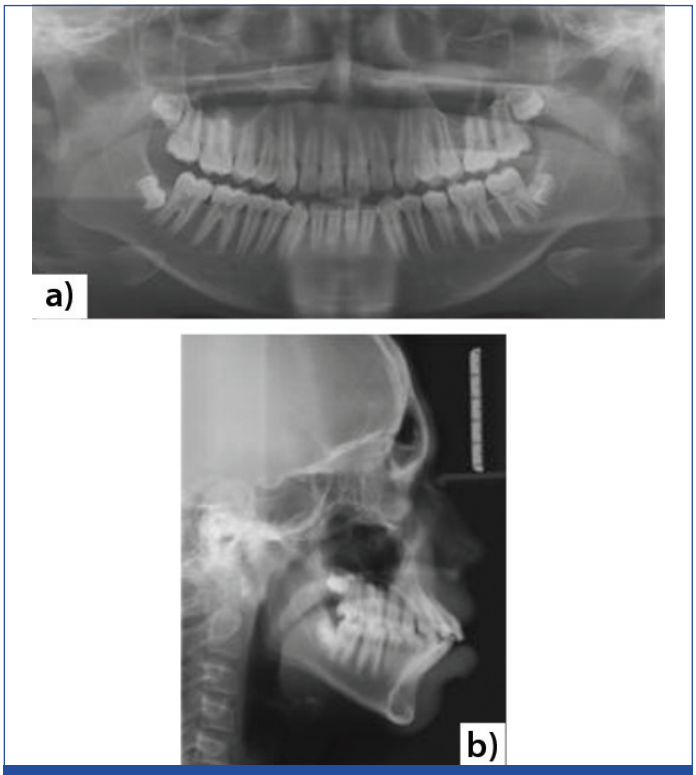
On examination, the patient's face appeared symmetrical with a convex profile and an upturned nasal base. The vertical dimension at rest was measured at 70 mm, and at occlusion, 67 mm, indicating a freeway space of approximately 3 mm. The interlabial gap of 5 mm at rest and the gingival exposure of 4 mm during smile with normal lip length and incompetent lip were suggestive of vertical maxillary excess. Intraoral examination revealed bilateral Class I molar and canine relation with overjet 5 mm and overbite 2 mm, with maxillary anterior arch spacing and mandibular anterior crowding [1] with a deficient chin. The upper dental midline is shifted to the left by 2 mm. [Table/Fig-1] The total available arch length tooth material discrepancy was 9 mm in the upper arch and 7 mm in the lower arch.



[Table/Fig-1]: Pre-treatment extraoral photographs (frontal smiling, frontal at rest, and profile views). Pre-treatment intraoral photographs (right, frontal, and left lateral views; upper and lower occlusal views).

Panoramic radiograph revealed all erupted permanent teeth except the maxillary and mandibular third molars, with adequate alveolar bone and normal root morphology. Temporomandibular Joint (TMJ) [Table/Fig-2] examination revealed no abnormal findings. Cephalometric examination revealed a skeletal Class II base with an ANB angle of 6° and a vertical growth pattern. The maxillary and mandibular incisors were proclined with respect to their corresponding bases, with a large mandibular plane angle associated with increased anterior facial height [Table/Fig-2].

Treatment objectives for the present case, considered both in terms of clinical radiographical parameters, are described in [Table/Fig-3].



[Table/Fig-2]: Pre-treatment orthopantomogram (a) and lateral cephalogram(b).

Parameter	Clinical Goal	Radiographic Goal
Facial profile & soft tissue	Improve facial profile and maintain harmonious soft-tissue balance	Confirm soft tissue harmony through cephalometric analysis (E-line, nasolabial angle, lip competence)
Incisor inclination & Overjet/Overbite	Correct anterior proclination and establish normal overbite & overjet	Cephalometric confirmation of proper incisor angulation and inter-incisal angle
Smile aesthetics	Reduce gingival exposure during smile	Incisor display on lateral cephalogram and smile analysis
Anterior alignment	Correct maxillary spacing and mandibular crowding	Radiographic confirmation of proper root parallelism and space closure on OPG
Molar & canine relationship	Pretreatment molar relationship was Class I, maintained throughout treatment, with improved intercuspation and arch coordination.	Cephalometric and model analysis to verify the skeletal and dental Class I relationship

[Table/Fig-3]: Treatment objectives.

Treatment Progress

The treatment plan was formulated to address the patient's primary concern of excessive gingival display and increased lower facial height, clinical features consistent with vertical maxillary excess. Considering the patient's chronological age, skeletal maturity, and preference to avoid surgical intervention, a non-surgical orthodontic approach employing mini-implant-assisted posterior intrusion was deemed most appropriate. This modality facilitates effective vertical control through molar intrusion, resulting in favorable mandibular autorotation and consequent improvement in facial esthetics, occlusal harmony, and overall facial balance.

Prior to commencement of treatment, comprehensive informed consent was obtained after a detailed explanation of the diagnosis, treatment alternatives, anticipated outcomes, and potential risks. Written informed consent was subsequently obtained in accordance with ethical and clinical guidelines. Initially, treatment involved the therapeutic extraction of the upper and lower first premolars. This was followed by banding the first molars and cementing with a soldered transpalatal arch and a lingual arch. The patient underwent treatment using Ormco Mini 2000 brackets with a 0.022″ × 0.028″ MBT prescription. Initial levelling and alignment were achieved using 0.014″ to 0.016″ Nitinol wires in both the upper and lower arches. After the anterior spaces were closed in the maxillary dentition. Mini-implants (Implant Genesis) measuring 1.4 mm × 8 mm were inserted, one in the midline of the anterior surface of the maxilla between and above the root tips of central incisors just beneath the ANS and two interradicular mini-implants of the same dimension were placed between the maxillary second premolars and first molars on both sides [2,3].

A midline mini-implant was activated using a stainless-steel ligature tie to deliver an intrusive force of approximately 80 g ([Table/Fig-4]), in conjunction with active tie-backs to facilitate simultaneous intrusion and retraction [4,5]. Following the extraction of the bilateral first premolars, an average of 8 mm of space was obtained on each side. Complete closure of the extraction spaces was accomplished after 19 months of active orthodontic therapy, after which finishing and detailing procedures were performed to refine the occlusal relationships. Upon completion of active treatment and appliance debonding, the patient was provided with maxillary and mandibular Hawley retainers for post-treatment stabilisation.

Treatment Result

The treatment resulted in significant improvement in the patient's smile aesthetics and facial symmetry. Pretreatment molar relationship was Class I, maintained throughout treatment, with improved intercuspation, arch coordination, and an ideal overjet and overbite (2 mm and 2.5 mm, respectively). Both the lips and chin

[Table/Fig-4]: Retraction with 0.019×0.025" SS wire with soldered hooks. Three mini implants were placed in the maxilla.

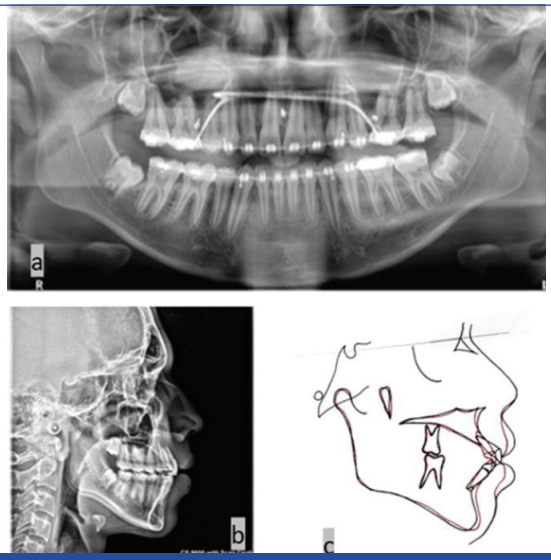
exhibited enhanced aesthetics [Table/Fig-5]. Orthodontic treatment led to marked improvement in skeletal, dental, and soft tissue parameters. Cephalometric evaluation showed 6 mm of maxillary incisor retraction (U1-NA reduced from 11 mm to 5 mm) and 5 mm of mandibular incisor uprighting (IMPA reduced from 98° to 93°). Vertical control was enhanced, evidenced by a reduction in the Frankfort Mandibular Plane Angle (FMA; 33° to 29°) and Gonion-Menton to Frankfort Horizontal Plane angle (GoMe-FHP; 34° to 30°), along with a decrease in Lower Anterior Facial Height (ANS-Me; 66 mm to 63 mm). Additionally, a notable reduction in Upper Incisor to Nasal Floor distance (U1-NF; 36 mm to 33 mm) suggested favorable mandibular autorotation [Table/Fig-6a,b]. Dental changes were significant, characterised by the retraction and uprighting of both maxillary and mandibular incisors. Post-treatment, 2 mm of maxillary incisor display was observed at rest and 8 mm on smile, indicating an aesthetically pleasing outcome.

[Table/Fig-5]: Post-treatment intraoral and extraoral photographs.

Measurement	Pre-treatment	Post-treatment
Anteroposterior skeletal (°)		
SNA	85	82
SNB	79	80
ANB	6	2
Vertical skeletal		
GoMe-FHP (°)	34	30
FMA (°)	33	29
ANS-Me (mm)	66	63
Dental		
Overjet (mm)	5	3
Overbite (mm)	2	2.5
U1/SN (°)	111	97
IMPA (°)	98	93
U1-NF (mm)	36	33
U1 to NA (°)	34	26

U1 to NA (mm)	11	5
L1 to NB (°)	34	23
L1 to NB (mm)	8	5
Interlabial gap (mm)	5	2
Soft tissue (mm)		
U lip-E line	3	1
L lip-E line	6	3

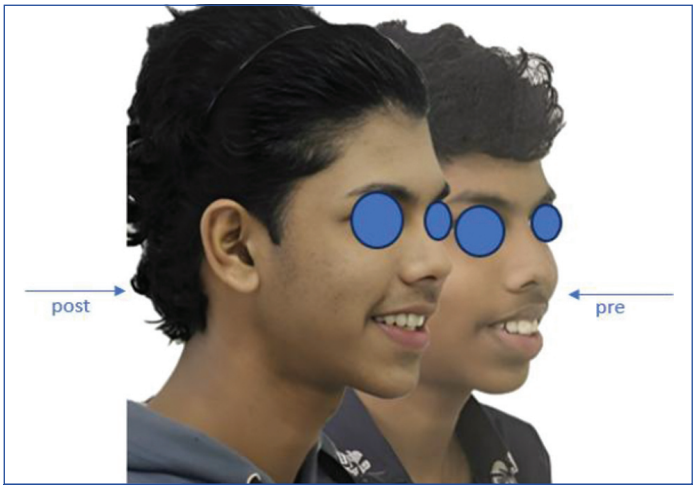
[Table/Fig-6a]: Cephalometric analysis.



[Table/Fig-6b]: Post-treatment orthopantomogram (a), lateral cephalogram (b) and superimposition (c).

Throughout the course of treatment, meticulous attention was given to maintaining gingival health. The patient was instructed on proper brushing techniques and advised to use chlorhexidine mouth rinses to minimise the risk of peri-implant inflammation. Progressive improvement in gingival contour was observed following alignment, with no evidence of gingival recession or hypertrophy.

Soft tissue analysis demonstrated enhanced facial aesthetics and lip competence. The interlabial gap reduced from 5 mm to 2 mm, and both upper and lower lips showed decreased protrusion relative to the E-line, contributing to a more harmonious facial profile [Table/Fig-7]. The Peer Assessment Rating (PAR) score reduced from 10 to 1, indicating a 90% improvement [Table/Fig-8].



[Table/Fig-7]: Comparison of post- and pre-treatment extraoral photographs.

Index of Treatment Need (IOTN)[6]		
Dental Health Component (DHC)	Start:3a	Finish: 1
Aesthetic Component (AC) [7]	Start: 5	Finish: 1
Peer Assessment Rating (PAR) [8]	Start: 10	Finish:1

[Table/Fig-8]: Dental Health Component.

DISCUSSION

Vertical Maxillary Excess (VME) presents a significant challenge in orthodontics due to its adverse effects on facial aesthetics and oral function. The Le Fort I osteotomy remains the treatment of choice in severe cases, but its invasive nature, cost, and morbidity make it less favorable for moderate discrepancies. Conventional orthodontic approaches such as intrusion arches, high-pull headgear, or bite-blocks have been employed, but these often provide limited intrusion, variable stability, and rely heavily on patient compliance [9].

In recent years, Temporary Anchorage Devices (TADs) have gained popularity as a minimally invasive and efficient option for anterior intrusion [10]. In the present case, 3 mm of incisor intrusion was achieved using mini-implants through a cephalometric radiograph, comparable to the results of Creekmore and Eklund [11] who reported up to 6 mm of intrusion achieved using implants. Parayaruthottam P and Antony V [12] reported a maxillary incisor intrusion of 4.5 mm. Studies by Polat-Ozsoy O et al. [13] and El Namrawy MM et al., [14] further confirm that mini-implants provide greater efficiency and superior anchorage preservation compared with conventional mechanics. Notably, no anchorage loss was observed in this case, supporting evidence from a meta-analysis by Papageorgiou SN et al., [15], which showed TADs preserve anchorage significantly better than traditional methods.

Despite these advantages, TADs are not without limitations. Potential complications include screw loosening, peri-implant inflammation, soft-tissue irritation, and, in rare cases, root resorption or alveolar bone loss if excessive forces are applied. Success depends on careful biomechanical planning, precise placement, and adequate force control [16].

Long-term stability remains a concern, especially in hyperdivergent growth patterns. Reports by Sugawara and Kuroda [16] suggest stable outcomes with TAD-assisted intrusion, although relapse is possible. Extended retention, including bonded retainers or occlusal splints, is recommended to minimise this risk.

Comparison with the case report by Kuroda S et al., demonstrates similar outcomes in both amount of intrusion and anchorage control, reinforcing the reliability of TADs as a non-surgical alternative for selected VME cases [16]. Future research should aim to identify the biological, mechanical, and clinical factors influencing TAD stability and to establish standardised protocols that enhance predictability and treatment efficiency.

CONCLUSION(S)

The orthodontic correction of VME using mini-implants represents a significant advancement in contemporary orthodontics. As the understanding and application of mini-implant technology continues to evolve, it holds promise for redefining the standard of care in treating VME, paving the way for more personalised, patient-centered approaches to orthodontic correction.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: May 20, 2025
- Manual Googling: Jan 10, 2026
- iThenticate Software: Jan 13, 2026 (18%)

ETYMOLOGY: Author Origin

EMENDATIONS: 9

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **May 19, 2025**
Date of Peer Review: **Sep 16, 2025**
Date of Acceptance: **Jan 15, 2026**
Date of Publishing: **May 01, 2026**