Cureus
Part of SPRINGER NATURE

Open Access Case Report

A Non-orthodontic Approach to Anterior Crossbite Restoration: A Clinical Case With 25 Years of Follow-Up

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Review began 10/11/2026
Review ended 11/08/2026
Published 11/12/2026

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DOI: 10.7759/cureus.119557

Abstract

This clinical report describes the multidisciplinary management of a 40-year-old man presenting with a complex Angle Class III malocclusion. The patient exhibited extensive anterior crossbite, multiple diastemata, and partial edentulism in the posterior segments, resulting in significant aesthetic and functional impairment. Despite these challenges, the patient maintained excellent oral hygiene and stable periodontal health and was a non-smoker.

The initial treatment plan proposed a combined orthodontic-orthognathic approach, involving pre-surgical orthodontic alignment followed by a Le Fort I osteotomy for maxillary advancement and subsequent prosthetic rehabilitation. However, citing concerns regarding age and the protracted duration of orthodontic-surgical protocols, the patient requested a more immediate solution. Consequently, an alternative fixed prosthetic rehabilitation was proposed. The primary objectives focused on restoring occlusal function, phonetics, and aesthetics while ensuring long-term structural longevity. The patient consented to a "compromised" prosthetic plan, acknowledging the deviation from the gold-standard orthodontic outcome.

The selected prosthetic intervention successfully corrected the anterior crossbite and restored dental harmony within a significantly abbreviated timeframe. This case demonstrates that when traditional orthodontic-surgical treatment is declined, a well-planned prosthetic approach can provide a pragmatic and stable alternative. The study emphasizes the importance of patient-centered care and the necessity of rigorous long-term follow-up to monitor the stability of such complex rehabilitations.

Categories: Dentistry
Keywords: anterior crossbite, fixed prosthetics, fixed prosthodontics, non-orthodontic treatment, prosthetic restoration

Introduction

Anterior crossbite is a dysfunction of the stomatognathic system that affects the physiological alignment of teeth and the correct occlusion between the upper and lower jaws. This anomaly can cause various problems, such as (a) speech or chewing impairment, (b) increased tooth wear or even tooth loss, and (c) distortions in the jaw and the temporomandibular joint [1]. Additionally, anterior crossbite discrepancies have been shown to significantly correlate with an increased prevalence of temporomandibular disorders and muscular discomfort [2].

Distinguishing between dental and skeletal Angle Class III malocclusions is essential during the diagnostic phase to establish an appropriate treatment plan. In a dental or pseudo-Class III malocclusion, the anomaly is confined strictly to the position of the teeth and alveolar processes, while the skeletal jaws exhibit a physiological relationship, and the patient's profile remains balanced and straight. In contrast, in a skeletal Class III malocclusion, the maxilla is smaller or retrognathic, and/or the mandible is larger or prognathic, resulting in a concave facial profile. Diagnosis is confirmed through cephalometric radiography, and the teeth typically compensate for the underlying skeletal discrepancy.

Treatment planning for the optimal correction of this condition in adult patients is complex and multidisciplinary, and the duration of treatment is generally long [3]. Although orthodontic treatment is the most common method for managing crossbite, in some cases, patients decline orthodontic treatment or combined orthodontic-orthognathic surgery due to financial costs, extended treatment duration, and the multi-stage nature of the procedure [4-8].

The desires, expectations, and constraints of our patients frequently compel us to formulate alternative treatment plans that diverge from the ideal treatment originally conceived. Especially regarding aesthetics, it appears that there is a very low percentage of agreement between patients' self-assessment and clinicians'

recording of needs [9].

Indications for prosthetic rehabilitation in patients with skeletal discrepancies primarily concern mild dental crossbites or pseudo-Class III malocclusions. However, under specific conditions, it can be utilized in patients who cannot undergo orthodontic or orthognathic surgical treatment. The advantages of "prosthetic camouflage" include immediate functional and aesthetic restoration for the patient [10]; nevertheless, the biological risks of such an approach must also be emphasized, including the necessity of altering tooth inclinations during preparation, potential pulpal sensitivity, the risk of endodontic complications, and alterations in anterior guidance dynamics.

Prosthetic restoration of anterior crossbite in adults poses a challenge for the dentist, who must address both the functionality and aesthetics of the stomatognathic system [11]. Prosthetic rehabilitation involves restoring teeth through the placement of crowns, bridges, implants, or other prosthetic restorations to correct occlusal anomalies and restore facial aesthetics and function [12].

This study evaluates the clinical utility and efficacy of prosthetic rehabilitation in correcting anterior crossbite as an alternative to orthodontic intervention. It explores restorative strategies designed to re-establish physiological occlusion, optimize stomatognathic function, and enhance facial harmony. Additionally, the analysis investigates critical success factors, including biomaterial selection, restorative techniques, the preservation of the vertical dimension of occlusion, and the maintenance of periodontal health [13]. A comprehensive assessment of these variables is fundamental in determining whether a case warrants conventional orthodontic tooth movement or a prosthetically driven approach.

Case Presentation

Case presentation and diagnosis

This report details the full-mouth rehabilitation of a 40-year-old man presenting with a complex dental status characterized by a multi-tooth anterior crossbite, partial edentulism (predominantly in the mandible), and significant interdental spacing (diastemata). The patient sought aesthetic restoration rather than functional correction; however, jaw movement analysis and patient consultation revealed he avoided hard foods. Mastication was difficult, not necessarily in terms of food fragmentation, which required extra effort, but in performing the function in a socially acceptable manner (Figure *1*).



FIGURE 1: Initial upper (A) and lower (B) diagnostic cast

The therapeutic objective was to achieve a synergy between biomechanical function and dento-facial aesthetics. The gold standard for such cases typically involves a multidisciplinary approach, specifically, pre-prosthetic orthodontic alignment followed by restorative procedures. However, as the patient declined orthodontic intervention, a prosthetic-driven rehabilitation was selected as the definitive alternative. Extensive prosthodontic reconstructions have been documented as viable, practical alternatives to achieve functional rehabilitation and dental harmony when orthodontic repositioning is declined by the patient [14].

The primary challenge lay in correcting the crossbite and managing the mandibular spacing through prosthetics alone. Success relied on the following: (1) precision jaw analysis: ensuring the new vertical dimension and centric relation supported functional harmony; (2) interdisciplinary collaboration: continuous communication between the clinician and the dental laboratory technician was essential to translate the diagnostic wax-up into the final restoration; and (3) long-term maintenance: rigorous postoperative monitoring was implemented to evaluate the structural integrity of the restorations and the health of the periodontal tissues.

History and clinical assessment

The medical history was non-contributory, with the patient reporting no systemic pathologies, neurological impairments, or sleep disorders. He was a non-smoker, and speech evaluation confirmed normal phonation.

A detailed functional analysis of jaw movement indicated a significant compensatory pattern: the patient avoided hard boluses due to the excessive muscular effort required for fragmentation.

The anamnesis further revealed a history of prolonged mixed dentition and detrimental childhood parafunctional habits, specifically lower-lip sucking and the frequent use of foreign objects (e.g., pencils). A family history was obtained to screen for genetic predispositions; however, no immediate family members exhibited similar malocclusions or dental discrepancies, suggesting an acquired rather than hereditary etiology.

Extraoral examination

Following an initial assessment, a systematic clinical examination was performed. The patient's facial expression suggested psychological distress related to aesthetic dissatisfaction with the anterior dental malalignment. Morphological analysis identified a mesofacial biotype with borderline skeletal disharmony.

Profile analysis revealed a concave profile and mild facial asymmetry. Frontal examination showed thin, relatively short lips with a slightly pale vermilion border. The philtrum of the upper lip exhibited a slight anterior projection, while the right aspects of the upper and lower lips showed minor posterior recession. Despite these observations, lip mobility was within normal limits, and no muscular sensitivity was recorded.

Palpation of the masticatory muscles elicited no tenderness. The temporomandibular joints were asymptomatic, with no detectable crepitus, clicking, or lateral deviation during function. The mandibular range of motion was satisfactory and within physiological limits.

At rest and while smiling, the left maxillary central incisor protruded significantly, impinging upon the labial soft tissues. Notable asymmetry was observed in both the smile line and the occlusal plane, contributing to the overall aesthetic disharmony (Figure *2*).



FIGURE 2: Preoperative intraoral view showing the positions and inclinations of the anterior teeth

Intraoral examination

The patient maintained satisfactory oral hygiene, characterized by healthy gingival tissues with an absence of plaque or bleeding on probing (Table *1*).

Tooth	Mesial	Distal	Buccal	Lingual/palatal	Mesial	Distal	Buccal	Lingual/palatal
Before prosthetic rehabilitation					Last follow-up			
#11	1	1	1	1	Extracted			
#12	1	1	1	1	Extracted			
#13	1	2	1	1	2	2	1	1
#14	1	1	1	1	2	2	1	1
#15	1	1	1	1	1	2	1	1
#16	2	3	1	2	3	4	2	3
#17	3	3	1	2	4	3	2	3
#18	3	1	1	2	4	2	2	2
#21	1	2	1	2	2	4	2	2
#22	1	2	1	2	4	5	3	3
#23	1	1	1	1	4	3	2	2
#24	1	1	1	1	3	4	2	3
#25	2	3	1	1	3	4	2	2
#26	3	1	2	2	3	2	2	2
#27	Missing							
#31	5	6	5	7	Extracted			
#32	2	2	1	2	5	5	2	2
#33	3	2	1	1	3	2	1	1
#34	3	2	1	2	5	2	1	2
#35	Missing							
#36	Missing							
#37	3	4	2	2	3	5	3	3
#41	2	1	1	1	Extracted			
#42	1	1	1	1	2	2	2	2
#43	1	2	1	2	2	2	2	2
#44	1	1	1	1	2	2	2	1
#45	1	2	1	1	2	2	2	1
#46	Missing							
#47	Missing							

TABLE 1: Periodontal measurements

The periodontal status was satisfactory, with a probing depth of less than 2 mm throughout. Gingival recessions were observed at the following sites: distal of #18 and #21; mesial and distal of #22, #32, and #34; distal of #45; and mesial of #41, #33, and #37. While the dentition exhibited physiological color and was free of caries or erosion, significant dento-gingival asymmetry was noted.

The maxillary dental midline was deviated 3 mm to the right of the facial midline, whereas the mandibular midline was coincident with the skeletal midline. Aesthetic analysis revealed insufficient maxillary incisor display at rest and asymmetrical gingival contours. Upon smiling, the upper lip positioned below the gingival

margin, concealing approximately 6 mm of the clinical crowns of the maxillary incisors.

A complex malocclusion was identified, including an anterior crossbite involving teeth #11, #12, and #13 with #31, #41, #42, and #43 and teeth #22 and #23 with #33. The patient presented with partial edentulism, with teeth #27, #35, #36, #46, and #47 missing. Significant diastemata and interdental spacing were recorded in the mandibular arch: #33-34, 2.5 mm; #43-44, 4 mm; and #31-42, 8 mm (residual space) (Figure 3).



FIGURE 3: Initial occlusal status showing the malocclusion and the anterior crossbite

Due to traumatic occlusal forces associated with the malocclusion, the mandibular left central incisor (#31) exhibited Grade III mobility, necessitating its extraction as part of the initial treatment phase.

Occlusal assessment and radiographic findings

Clinical analysis confirmed an Angle Class III malocclusion characterized by an anterior crossbite, a deviated midline, an increased overbite, and a negative overjet.

The patient was guided into centric relation, and records were obtained using an anterior jig and recording wax. Functional interference was noted during excursive movements; specifically, premature contacts during protrusion and lateral excursions restricted physiological mandibular pathways. A significant discrepancy between centric relation (CR) and centric occlusion (CO) was identified, suggesting a functional shift and an adaptive mandibular posture.

Panoramic and periapical X-ray assessment revealed mild alveolar bone resorption in the mandible, primarily associated with long-term partial edentulism. In the maxilla, a slight reduction in alveolar bone height was observed (Figure 4).

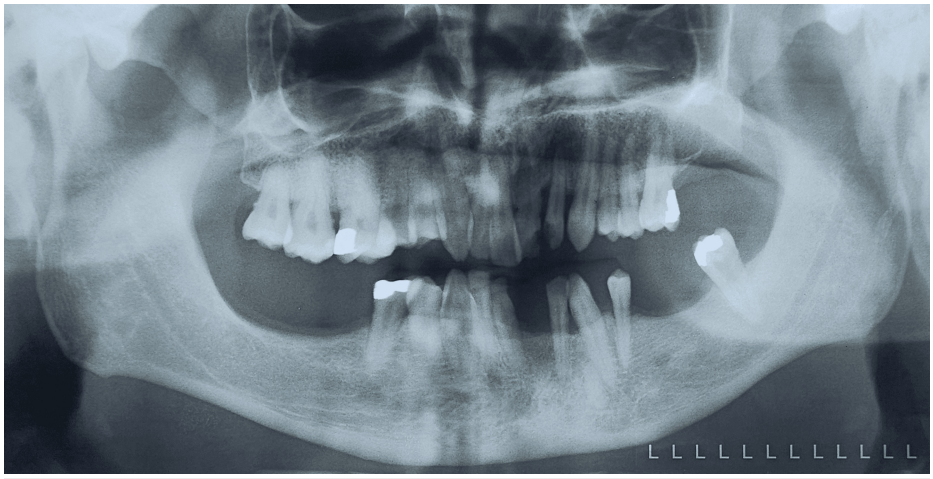


FIGURE 4: Preoperative panoramic X-ray showing the missing teeth and the dental condition

Cephalometric analysis confirmed a skeletal Class III relationship (sella-nasion to A-point angle (SNA)=75.70°; sella-nasion to B-point angle (SNB)=78.80°; A-point-nasion-B-point angle (ANB)=-3.10°) primarily attributed to maxillary retrognathism. Regarding the vertical dimension, a hypodivergent pattern was also observed with a decreased angle between the mandibular and palatal planes (mandibular plane to palatal plane angle (MP/PP)=12.30°). The inclination of the maxillary central incisors relative to the palatal plane (upper incisor to palatal plane angle (UI/PP)=109.80°) was within physiological limits, whereas the mandibular incisor inclination relative to the mandibular plane (lower incisor to mandibular plane angle (L1/MP)=94.10°) was increased (Table *2*).

Measurement/parameter	Value	Clinical interpretation/description
SNA	75.70°	Maxillary retrognathism (contributes to skeletal Class III)
SNB	78.80°	Mandibular anteroposterior position
ANB	-3.10°	Skeletal Class III relationship
MP/PP	12.30°	Hypodivergent vertical pattern (decreased mandibular/palatal plane angle)
UI/PP	109.80°	Maxillary central incisor inclination relative to palatal plane (within physiological limits)
L1/MP	94.10°	Mandibular incisor inclination relative to mandibular plane (increased)

TABLE 2: Cephalometric analysis

SNA: sella-nasion to A-point angle; SNB: sella-nasion to B-point angle; ANB: A-point-nasion-B-point angle; MP/PP: mandibular plane to palatal plane angle; UI/PP: upper incisor to palatal plane angle; L1/MP: lower incisor to mandibular plane angle

Treatment plan

In this instance, the gold-standard intervention was orthodontic therapy followed by prosthetic rehabilitation of the edentulous spaces. Orthodontic treatment was proposed to facilitate anatomical tooth redistribution, restore physiological occlusion, and ensure long-term functional stability. However, drawbacks include an extended treatment timeline (18-36 months), delayed aesthetic gratification, and increased financial and maintenance commitments.

The patient expressed a psychological aversion to orthodontic appliances, not due to financial constraints, but rather a reluctance to undergo a protracted procedure lacking immediate results. The patient presented with exacting aesthetic expectations, specifically regarding the facial midline, dental symmetry, and the smile arc. Influenced by misconceptions regarding aesthetic dentistry, the patient prioritized a rapid restorative outcome, seeking "instant aesthetics".

The primary therapeutic objective was to reconcile the patient's aesthetic goals with functional

requirements and the biological longevity of the restorations. The functional integrity of the stomatognathic system was analyzed through model articulation and a diagnostic wax-up (Figure 5). Following the patient's rejection of the orthodontic phase, a comprehensive prosthetic rehabilitation was proposed as the definitive alternative.



FIGURE 5: Diagnostic wax-up showing the restoration of the maxillary and mandibular anterior teeth and the correction of the crossbite

While prosthetic rehabilitation offers immediate aesthetic and functional enhancement with reduced treatment time, it necessitates the irreversible removal of sound dental tissue and offers limited scope for correcting underlying malocclusion. Furthermore, it demands long-term maintenance to address potential restorative wear. In cases with significant skeletal involvement, the efficacy of a purely prosthetic approach remains limited. The final treatment plan was finalized through an integrated assessment of functional, aesthetic, biological, and temporal parameters, culminating in the patient's informed consent.

Treatment phases were as follows: (1) periodontal cleaning, scaling, and root planing, (2) frenectomy of the lower lip to prevent further recession, and (3) extractions (#11, #12, and #41) and endodontic treatments (#13, #22, #23, #42, and #43). (4) Metallic posts and cores were placed, and teeth were rebuilt to change the endodontic axis and allow for normal occlusion. (5) Abutment teeth were prepared with a light chamfer finish line (for the maxilla: #15, #14, #13, #21, #22, #23, and #24; for the mandible: #45, #44, #43, #42, #32, #33, #34, and #37). (6) Temporary restorations were placed for two months to test the neuromuscular system's adaptation to the new 3 mm increased vertical dimension and group function occlusal scheme. (7) Gold-platinum-porcelain restorations were placed (for the maxilla: porcelain-fused-to-metal (PFM) bridge #15-14-13-21-22-23-24 with pontics #11 and #12; for the mandible: PFM bridge #34-37 with pontics #35 and #36, PFM bridge #33-32-42-43 with pontics #31 and #41, and PFM bridge #44-45-46 with a cantilever #46) and luting with glass-ionomer cement (Table 3).

		Before treatment	After treatment
Overbite	#11-41	-5 mm	1 mm
Overjet	#11-41	-1.5 mm	2 mm
Freeway space	-	0.5 mm	2.5 mm
Vertical dimension of occlusion	-	-	+3 mm

TABLE 3: Pre- and post-treatment occlusal parameters

Follow-up

The patient was maintained on an annual recall schedule for comprehensive clinical and radiographic

assessment. Recalls were scheduled every six months and included (1) radiographic evaluation using intraoral radiographs, (2) a periodontal chart, (3) plaque and bleeding indices, and (4) inspection of restoration margins. The patient underwent regular periodontal maintenance, and no prosthetic repairs were required.

At the 25-year follow-up, the prosthetic restorations demonstrated continued structural integrity, the periodontium remained stable and healthy, and the temporomandibular joint was entirely asymptomatic (Figure *6* and Table *1*).



FIGURE 6: Follow-up: the patient's smile 25 years after the placement of the prosthetic restorations

Discussion

Patients increasingly present with heightened aesthetic expectations and a growing preference for "accelerated" or immediate clinical outcomes. While such rapid modalities may be viable in specific contexts, clinicians must emphasize that achieving sustainable success in complex cases often necessitates a protracted therapeutic commitment [11,15,16].

Adult orthodontics exemplifies a modality that, despite its protracted timeline, yields superior long-term stability and biological rewards [16]. Conversely, orthodontic alternatives in adults often involve aggressive, unconventional, and non-conservative protocols [1,17]. While the literature extensively documents crossbite correction via orthodontics, reports of successful purely prosthetic rehabilitation without orthodontic intervention remain scarce [12,18].

The clinical case presented was characterized by functional impairment due to extensive anterior crossbite and aesthetic deficiency, the latter being the patient's primary complaint [1]. Although the gold-standard approach would have involved orthodontic repositioning followed by prosthetic replacement of missing teeth, the patient declined this pathway due to the projected duration of treatment [1].

The finalized treatment plan necessitated a combination of extractions, endodontic therapies, and comprehensive prosthetic rehabilitation. Even though increasing the angulation between the coronal and radicular segments of the cast post-and-core increases the risk of fracture, the use of custom-made cast metal posts for tooth angulation modification was carefully planned and selected because the patient presented no parafunctional habits [19,20]. The intervention successfully corrected the reverse articulation and aligned the maxillary and mandibular midlines to restore dental symmetry. Postoperative evaluation confirmed satisfactory tooth proportions at rest and an optimized smile line. Prosthetic design incorporated slightly increased clinical crown dimensions, achieving a more harmonious facial profile. Beyond aesthetic gains, the treatment significantly enhanced the patient's self-esteem and restored stomatognathic function across all excursive mandibular movements.

Comprehensive rehabilitation in adults can mitigate social anxiety and substantially improve quality of life [15]. Nevertheless, rigorous long-term follow-up is imperative, as periodontal stability remains contingent upon multiple physiological factors [13]. In this instance, the patient's excellent oral hygiene compliance significantly bolstered the prognosis.

The primary limitation of this specific technique remains the necessity for tooth extraction. While a multidisciplinary approach, incorporating orthodontics, is ideal for complex cases, it is not always feasible

given patient-specific constraints. Therefore, clinical compromises are often necessary. Such deviations from the "ideal" protocol do not reflect a lack of clinical proficiency; rather, they represent a pragmatic, patient-centered approach to achieving primary therapeutic goals.

Conclusions

The clinician must rigorously evaluate all potential therapeutic modalities and prospectively assess the outcomes of each intervention. Key determinants in this decision-making process include the extent of the lesion, the risk of suboptimal clinical choices, and the specific requirements for aesthetic rehabilitation, balanced against the practitioner's technical proficiency and familiarity with contemporary techniques. The initial consultation is critical; the rapport established by the examiner is fundamental to securing patient compliance and trust, effectively inaugurating a transparent clinical dialogue.

This 25-year follow-up case demonstrates that when orthodontic treatment is rejected, a prosthetically guided solution can achieve long-term clinical success. However, this approach entails significant irreversible biological costs, including extensive devitalization, post placement, and substantial tooth reduction, and must be recognized as an exceptional clinical compromise rather than a standard alternative.

Furthermore, while prosthetic rehabilitation successfully corrected the dental manifestations of the anterior crossbite, it did not address the underlying skeletal Class III discrepancy. Because these findings are derived from a single patient, this protocol should not be generalized as an equivalent alternative to comprehensive orthodontic or orthognathic treatment, and its success heavily depends on rigorous functional balance and patient cooperation.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Maria Kokoti, Aikaterini Papagkika

Acquisition, analysis, or interpretation of data: Maria Kokoti, Aikaterini Papagkika

Drafting of the manuscript: Maria Kokoti, Aikaterini Papagkika

Critical review of the manuscript for important intellectual content: Maria Kokoti, Aikaterini Papagkika

Supervision: Maria Kokoti, Aikaterini Papagkika

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Acknowledgements

The authors express sincere gratitude to the patient for his trust, patience, and compliance with follow-up examinations, as well as for his consent to publish the clinical photographs presented in this case study. This work would not have been possible without the invaluable support and cooperation of Nikolaos Vorilas, dental technician; Michail Vasoglou, DDS, MSc, PhD, orthodontist; Vasiliki Anagnostopoulou, MA, MSc; and Leonidas Anagnostopoulos and the significant contribution of Anastasia Tsiogka, MD, MSc, FEBO, PhD, ophthalmic surgeon, Eugenideio Hospital-NKUA.

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