

Non-Extraction Correction of Class II Division I Malocclusion with Clearpath Aligners: A Clinical Case Report

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Abstract

Background

Clear aligner therapy has emerged as a popular alternative to conventional fixed appliances due to its esthetic appeal, comfort, and ability to maintain oral hygiene. Although traditionally limited to mild or moderate cases, advances in digital planning and biomechanics have extended its application to more complex malocclusions.

Case Presentation

This report describes the non-extraction management of a 20-year-old female patient presenting with Class II Division I malocclusion, upper anterior proclination, and moderate crowding in the maxillary arch. Treatment was carried out using ClearPath® aligners over a period of ten months. Interproximal reduction (IPR), attachments, and controlled arch expansion were incorporated to achieve desired tooth movements. Periodontal health and aligner fit were regularly assessed, both of which remained satisfactory throughout the course of treatment.

Results

At the end of therapy, the patient achieved proper overjet and overbite, improved lip posture, and well-aligned maxillary and mandibular arches. Dental crowding was successfully resolved, with stable occlusion and no adverse periodontal effects.

Conclusion

Clear Path® aligners, when combined with precise digital planning, IPR, and attachments, can effectively manage selected Class II Division I malocclusions without extractions. This case highlights the potential of clear aligner systems as a viable esthetic and functional treatment modality in suitable patients.

Key Words: Clear aligners; Clear path®; Class II division I malocclusion; Interproximal reduction; Orthodontics; Attachments

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Introduction

Class II Division I malocclusion is among the most prevalent orthodontic problems globally, accounting for a significant proportion of patients seeking orthodontic treatment [1]. This malocclusion is characterized by a distal relationship of the mandible to the maxilla, typically accompanied by an increased overjet, proclined maxillary incisors, a convex facial profile, and often lip incompetence [2,3]. Etiologically, it may arise from a retrognathic mandible, maxillary protrusion, or a combination of skeletal and dental discrepancies, with both genetic and environmental influences playing contributory roles [4].

Conventionally, treatment modalities for Class II Division I malocclusions vary depending on the patient's age, growth potential, and severity of the discrepancy. In growing individuals, functional appliances such as the Twin Block or Herbst appliance are frequently employed to stimulate mandibular growth or

reposition the jaws [5]. In contrast, treatment in non-growing patients often involves dental camouflage through extractions or, in severe cases, surgical orthodontics to achieve skeletal correction [6]. However, both these approaches are associated with varying degrees of invasiveness, patient discomfort, and esthetic concerns, especially with the use of conventional fixed appliances.

In recent years, there has been a paradigm shift in orthodontic care, driven by the growing demand for esthetic, comfortable, and removable alternatives to fixed braces. Clear aligner therapy has emerged as a popular option, offering a discreet and hygienic means of correcting malocclusions through a series of computer-generated, custom-fabricated plastic trays that sequentially move teeth into their desired positions [7]. Among the systems available, ClearPath® Aligners-developed in Pakistan-have gained clinical acceptance in South Asian and Middle Eastern markets for their effectiveness in treating mild to moderate malocclusions using proprietary thermoform materials and digital treatment planning

[8].

While there is increasing evidence supporting the use of clear aligners for resolving crowding, spacing, and minor occlusal discrepancies, the literature on their application in complex cases, such as Class II Division I malocclusions, remains limited. Most aligner systems face challenges in controlling bodily tooth movement, torque, and interarch correction, particularly in non-extraction treatment plans [9,10]. Nevertheless, with careful case selection, the integration of precision cuts for elastics, and appropriate staging protocols, successful correction of Class II cases using clear aligners has been documented [11].

This clinical case report presents the non-extraction management of a Class II Division I malocclusion in a young adult patient using ClearPath® Aligners. The case highlights the diagnostic approach, virtual treatment planning, aligner biomechanics, use of Class II elastics, and the esthetic and functional outcomes achieved over the course of treatment. It aims to contribute to the growing body of evidence supporting the viability of clear aligners in treating complex orthodontic problems while preserving patient comfort and esthetic demands.

Case Report

A 20-year-old female patient, with no relevant medical or familial history, reported for orthodontic consultation with chief concerns of proclined upper front teeth, dental crowding, and irregular alignment. She was in good general health, and her dental history was unremarkable, with no record of previous complications.

Extraoral examination revealed a mesencephalic head form and mesoprosopic facial proportions, with a symmetrical frontal profile. Her facial profile was orthognathic, accompanied by a medium-sized nose and competent lips (Figure 1). The interlabial gap was within normal limits, and there were no clinical indications of temporomandibular joint dysfunction.

Smile analysis demonstrated a non-consonant smile arc with noticeable disruption in dental alignment. Intraoral findings indicated fair oral hygiene and stable periodontal health. Bilateral Class II molar and canine relationships were present, with incisors in a Class II Division I relationship. The overjet measured approximately 4 mm, and the overbite was 2 mm. The maxillary midline was coincident with the facial midline, whereas the mandibular midline was deviated 0.5 mm to the right.

Moderate crowding was observed in the maxillary arch, and mild crowding was noted in the mandibular arch. Panoramic radiography confirmed healthy supporting bone levels, with no evidence of carious lesions, root resorption, or other pathological changes. Cephalometric assessment indicated a skeletal Class I base, normodivergent growth pattern, proclined maxillary and mandibular incisors, and a reduced nasolabial angle.

Treatment Objectives

The primary objective of the orthodontic intervention was to

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address the patient's chief concerns through the use of ClearPath® aligners. The treatment plan also sought to achieve a stable, functional, and healthy occlusion, while simultaneously improving the esthetic quality of the smile.

Treatment Options

Several treatment options were presented to the patient.

The first involved orthodontic correction with traditional fixed appliances; however, the patient was hesitant to proceed with this approach due to esthetic concerns.

The alternative proposed was treatment with clear aligners, which aligned with the patient's preference for a discreet and comfortable orthodontic solution.

Treatment Procedure

After a comprehensive evaluation of the patient's medical and dental history, along with clinical examination, a complete series of intraoral and extraoral photographs was taken, and digital impressions were obtained using an intraoral scanner. These diagnostic records were forwarded to the ClearPath facility for the development of a personalized treatment plan. Panoramic radiographic assessment confirmed satisfactory bone levels and good oral hygiene, supporting the decision to proceed with clear aligner therapy without the need for any preliminary dental procedures.

Based on the submitted records, a 3D virtual treatment setup was prepared, outlining 25 sequential stages for both the maxillary and mandibular arches. The treatment plan followed a non-extraction approach, incorporating interproximal reduction (IPR) and controlled arch expansion to address the patient's malocclusion. A digital simulation of the planned tooth movements (Figure 2) was presented to the patient, who carefully reviewed the proposed corrections and gave her approval, expressing full confidence in the plan.

The finalized treatment proposal was provided to the patient within one week of record submission. She responded favorably to the outlined strategy, and no modifications were required. The estimated treatment duration was approximately ten months, to which the patient agreed, enabling the prompt commencement of aligner therapy.

IPR Technique

Interproximal reduction (IPR) is a widely utilized orthodontic technique for creating space by carefully removing minimal amounts of enamel from the proximal surfaces of teeth. This controlled enamel reduction facilitates the resolution of mild to moderate crowding, aids in alignment, and helps maintain long-term occlusal stability without the need for extractions [12]. Various methods are available to perform IPR, including the use of diamond burs, abrasive discs, and manual abrasive strips, with the choice of technique depending on the clinical requirements and

operator preference [13,14].

In the present case, IPR was performed using a fine, double-sided, diamond-coated abrasive strip to achieve precise and conservative enamel removal. The amount of enamel reduced was measured with an IPR gauge at each contact point to prevent over-reduction. Upon completion of the procedure, topical fluoride was applied to promote enamel remineralization and minimize the risk of post-procedural sensitivity or decalcification, in accordance with established preventive protocols [15,16].

Attachment Placement

Attachments play a crucial role in enhancing the efficiency and predictability of clear aligner therapy by improving the aligner’s ability to achieve planned tooth movements. These small, tooth-colored composite auxiliaries are bonded to the enamel surface and are strategically designed to facilitate challenging movements, including extrusion, rotation, and intrusion [17]. Their size, shape, and placement are carefully customized based on the patient’s digital treatment plan to optimize retention, force application, and movement precision [18].

Serving as biomechanical aids, attachments allow clear aligners to exert controlled and targeted forces, which are essential for executing complex orthodontic movements effectively. Accurate placement and regular assessment of attachments throughout treatment are vital for maximizing efficiency, maintaining planned biomechanics, and ensuring favorable clinical outcomes [19].

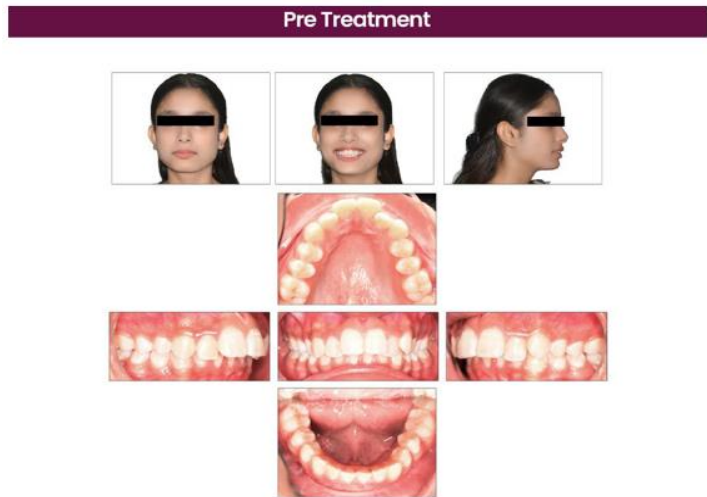


Figure 1: Pre Treatment; Extraoral & Intraoral Photographs.

Treatment Progress

Once the digital treatment simulation was approved, the manufacturer provided detailed instruction forms (Figures 3 and 4) along with 25 sets of upper and lower aligners. Each set was prescribed to be worn for approximately 22 hours per day, with replacement every ten days. Comprehensive oral hygiene and periodontal care instructions were given to the patient prior to commencing therapy.

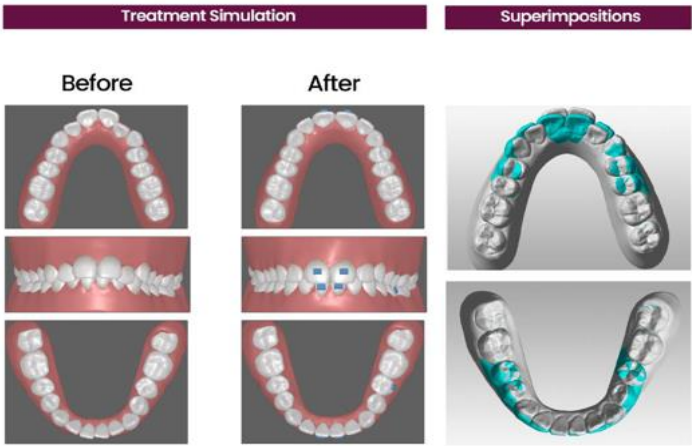


Figure 2: 3D Treatment Plan (A) Before & After, (B) Superimpositions.

For tooth leveling and movement control, extrusion attachments were bonded to the maxillary central incisors, while intrusion attachments were placed on the mandibular central incisors using a transfer tray. Additionally, a derotation attachment was positioned on the mandibular left second premolar. Following attachment placement, the first set of aligners was delivered, and an appointment for interproximal reduction (IPR) was scheduled prior to transitioning to the second aligner set.

During the IPR session, enamel reduction was performed at six sites in the maxillary arch: between the lateral incisor and canine, canine and first premolar, and first and second premolars bilaterally. 0.5 mm of enamel was removed at each site. The patient proceeded with the aligner sequence as planned and was reviewed at three-month intervals. At each follow-up visit, both periodontal health and aligner fit were evaluated and found to be satisfactory throughout the treatment period.

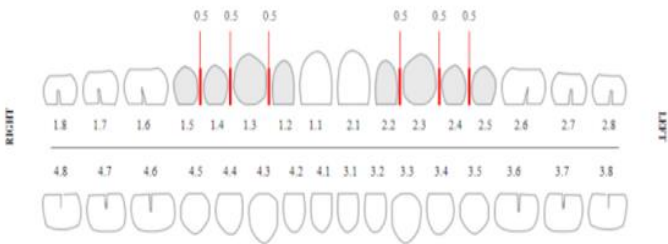


Figure 3: IPR Form.

Treatment Result

The treatment was completed over a period of ten months, during which each aligner was worn for approximately 22 hours per day and replaced every ten days. At the end of therapy, dental crowding was effectively resolved, resulting in improved lip posture and normalization of the interlabial gap. The final outcome demonstrated ideal overjet and overbite relationships, well-aligned dentition, and a stable, functional occlusion (Figure 5).

Both maxillary and mandibular arches were successfully

coordinated, contributing to enhanced facial esthetics and improved masticatory function. Periodontal status was carefully monitored at regular intervals, with no clinical signs of gingival recession, inflammation, or periodontal pocketing observed, thereby confirming the preservation of optimal periodontal health throughout the course of treatment.

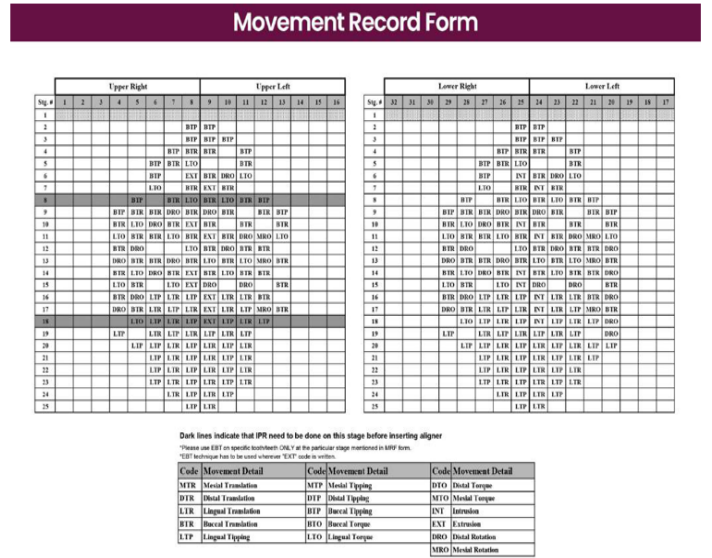


Figure 4: Movement Record Form.



Figure 5: Post Treatment Records; Extra Oral And Intra Oral Photographs.

Discussion

Clear aligner therapy has become an increasingly popular alternative to fixed appliances due to its esthetic appeal, comfort, and ability to maintain oral hygiene during treatment [20]. This case demonstrated the successful non-extraction management of a Class II Division I malocclusion with ClearPath® aligners, addressing both functional and esthetic concerns within a relatively short treatment duration of ten months. Historically, Class II Division I cases have posed significant

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biomechanical challenges, particularly in achieving controlled incisor retraction and correcting sagittal discrepancies [4]. Conventional management often involves extraction therapy or the use of functional appliances in growing patients [5,6]. However, with the advent of digital orthodontics and improved aligner biomechanics, clear aligners can now be used successfully in selected Class II cases, especially when skeletal discrepancy is mild to moderate and dental compensation is feasible [21]. In the present case, sagittal correction was facilitated through the use of attachments, interproximal reduction (IPR), and controlled arch expansion. Several studies have highlighted the importance of such auxiliaries in enhancing the predictability of clear aligner therapy, particularly for movements like rotation, extrusion, and intrusion [22]. Kravitz et al. reported that aligners, when used with optimized attachments, significantly improve accuracy in tooth movement, although certain complex movements remain less predictable compared to fixed appliances [23]. Crowding was effectively managed using IPR and arch expansion instead of extractions. Sheridan first introduced IPR as a conservative means of gaining space without altering arch form [12]. Long-term studies have confirmed its safety when performed conservatively, provided proper polishing and fluoride application are carried out to prevent demineralization [15,16]. In this case, enamel reduction was carefully monitored with an IPR gauge, and fluoride therapy was applied post-procedure, ensuring periodontal and enamel integrity throughout treatment. One of the advantages of clear aligners is the reduced risk of plaque accumulation and gingival inflammation compared to fixed appliances [24]. In the current case, periodontal health remained stable, with no evidence of gingival recession or pocketing, consistent with findings from previous studies [25]. The removability of aligners allowed the patient to maintain adequate oral hygiene, which is a key factor in achieving healthy treatment outcomes. The total treatment time of ten months is comparable to or shorter than average durations reported for similar cases managed with aligners [11]. This efficiency can be attributed to patient compliance, proper staging of tooth movements, and the use of auxiliaries. Patient motivation and adherence to prescribed wear time remain critical determinants of success with clear aligners [26]. Despite the favorable results, it is important to acknowledge that clear aligners have limitations in managing severe skeletal discrepancies, large anteroposterior corrections, or cases requiring significant vertical control [27]. Careful case selection, precise digital planning, and regular monitoring are essential to achieving predictable results. Further prospective clinical studies and randomized controlled trials are needed to establish standardized protocols for managing Class II Division I malocclusions with aligners.

Conclusion

This case report illustrates the successful non-extraction management of a Class II Division I malocclusion using ClearPath® aligners. Through careful treatment planning, incorporation of attachments, and controlled interproximal reduction, the patient’s chief concerns were effectively addressed, resulting in improved dental alignment, normalized overjet and overbite, and enhanced smile esthetics within a relatively short treatment duration.

The favorable periodontal response and maintenance of oral hygiene throughout treatment highlight the advantages of clear aligner therapy in promoting both dental health and patient comfort. While limitations exist in the management of severe skeletal discrepancies, this case reinforces that clear aligners, when used with appropriate biomechanics and patient compliance, represent a viable and esthetic alternative to fixed appliances for selected Class II cases.

Consent & Conflict Of Interest

A written consent form was signed from the patient for use of the dental records for publications & social media marketing. Also, there is no conflict of interest with this paper.

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