

Orthodontic Management of Crowding With Clearpath Aligners: A Non-Extraction Approach

Nagani N* and Wahab W

Consultant Orthodontist, BDS, MDS-Orthodontics, DentoCorrect Clinic Lahore, Pakistan

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***Corresponding author:** Paul S,
Consultant Orthodontist, BDS, MDS-
Orthodontics, DentoCorrect Clinic Lahore,
Pakistan;

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Abstract

This case report presents the successful management of dental crowding in a 20-year-old female patient using ClearPath aligners. The treatment lasted seven months and consisted of 20 stages of upper and lower aligners, worn for 22 hours per day. A non-extraction method was employed, incorporating interproximal reduction and arch expansion to address crowding and alignment concerns. The approach resulted in well-aligned teeth while preserving periodontal health without complications. This case underscores the effectiveness of clear aligners in correcting crowding and highlights the crucial role of patient adherence in achieving optimal results.

Key Words: Clear aligners; Crowding; Adult orthodontics; Malocclusion

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Introduction

Crowding is a dental condition characterized by insufficient space in the dental arch for proper tooth alignment. It can lead to overlapping, rotations, and displacement of teeth, making oral hygiene maintenance challenging. The severity of crowding can range from mild to severe and may be influenced by genetic and environmental factors. Genetic factors, such as hereditary discrepancies between tooth size and jaw size, play a crucial role in the development of crowding [1]. Environmental factors, including early tooth loss, abnormal eruption patterns, and oral habits such as thumb sucking, can also contribute to space discrepancies [2].

Effective treatment planning requires a thorough diagnosis using clinical and radiographic assessments. Diagnostic tools such as cephalometric analysis, panoramic radiographs, and 3D digital scanning allow orthodontists to evaluate arch length discrepancies, skeletal relationships, and tooth positioning [3]. Treatment options for crowding depend on the severity of the condition and patient-specific factors.

Various treatment modalities can help resolve crowding, including:
Arch Expansion: Increasing arch width using expanders can create additional space, particularly in growing patients [4].

Interproximal Reduction (IPR): Removing small amounts of enamel from interproximal surfaces can provide minor space without extractions [5].

Extractions: In severe cases, removing premolars or other strategically selected teeth can help redistribute available space and achieve proper alignment [6].

Orthodontic Appliances: Fixed braces and clear aligners such as ClearPath aligners offer solutions for aligning teeth effectively

While considering patient aesthetics and comfort [7,8].

Clear aligners utilize controlled force application to achieve tooth movement. Each aligner in the series applies specific pressures to selected teeth, guiding them through programmed movements such as tipping, rotation, and intrusion [9]. Advanced digital technologies, including three-dimensional (3D) scanning and computer-aided design (CAD), enable precise treatment planning and prediction of outcomes [10]. Attachments, interproximal reduction (IPR), and auxiliary techniques enhance aligner efficacy in cases of moderate to severe crowding [11].

Clear aligners offer several benefits, including enhanced aesthetics, improved oral hygiene, and reduced risk of enamel decalcification compared to fixed appliances [12]. Additionally, they are associated with lower levels of pain and discomfort [13]. However, limitations exist, particularly in cases requiring significant arch expansion or bodily tooth movement, where traditional braces may be more effective [14].

This case report explores the orthodontic management of an adult patient with moderate dental crowding using ClearPath aligners. It outlines the complete treatment approach, covering initial diagnostic assessments, aligner design and fabrication, clinical application, and ongoing progress evaluations. Additionally, the report discusses the benefits and potential challenges associated with clear aligner therapy for correcting malocclusion. It also emphasizes the significance of digital treatment planning tools, which facilitate precise tooth movement simulations and enable customized aligner adjustments to meet individual clinical requirements.

Case Report

A 20-year-old woman in good health sought orthodontic treatment due to concerns about dental crowding and misalignment. Her medical history was unremarkable, with no known hereditary or dental conditions. Extraoral examination revealed a mesocephalic head shape, mesoprosopic facial structure, symmetrical frontal appearance, orthognathic profile, medium-sized nose, and well-positioned lips (Figure 1). No signs of temporomandibular joint dysfunction were observed.

Smile evaluation showed an adequate display of the upper incisors, though they were not perfectly aligned, while the smile arc remained harmonious. Intraoral assessment indicated fair oral hygiene and a stable periodontal condition. The molars and canines exhibited Class I relationships, with an overjet of 2 mm and an overbite of 1.5 mm. The maxillary midline was centered, while the mandibular midline had a slight leftward deviation.

Mild crowding was noted, measuring 1.5 mm in the upper arch and 2 mm in the lower arch. A panoramic radiograph confirmed a healthy periodontal condition, with no evidence of caries, root resorption, or other dental abnormalities. Cephalometric analysis indicated a skeletal Class I relationship, a normodivergent facial pattern, and an acute nasolabial angle.

Treatment Objectives

The primary goal of orthodontic treatment was to effectively resolve the patient's concerns using ClearPath aligners. Additionally, the treatment focused on establishing a stable, functional, and healthy bite while enhancing overall dental aesthetics.

Treatment Options

Various treatment options were discussed with the patient, considering the following factors:

The first option involved traditional braces for orthodontic correction. However, the patient preferred a more aesthetically discreet alternative and opted against this approach.

The second option suggested the use of clear aligners, which aligned with the patient's preference for a less noticeable treatment method.

Both treatment plans followed a non-extraction approach incorporating arch expansion and interproximal reduction (IPR) to effectively address the patient's concerns.

Treatment Procedure

Following a comprehensive review of the patient's history and clinical examination, intraoral and extraoral photographs were taken, and optical impressions were captured through intraoral scanning. These records were forwarded to the ClearPath facility for the development of a personalized treatment plan. A panoramic X-ray confirmed adequate bone support and satisfactory oral

hygiene, ensuring the patient met the criteria for orthodontic treatment without the need for additional dental procedures, making clear aligner therapy a viable option.

Based on the provided records, a 3D treatment plan was generated, consisting of 20 stages for both the upper and lower arches. The plan adhered to a non-extraction approach, incorporating interproximal reduction (IPR) and arch expansion to effectively address the patient's dental concerns. A treatment simulation (Figure 2) was presented, and after reviewing the plan, the patient expressed satisfaction and approved the proposed course of action. The treatment plan was discussed with the patient within seven days of record submission. She was pleased with the outlined approach, and no adjustments were required. The total treatment duration was estimated at approximately seven months, which the patient found acceptable, allowing the treatment to commence promptly.

Arch Expansion with Clear Aligners

Arch expansion with clear aligners is a technique used to increase the width of the dental arches, creating additional space to alleviate crowding and improve occlusion. This method involves programmed lateral movements of the posterior teeth through sequential aligners, gradually widening the arch. Clear aligners apply controlled forces to achieve expansion while maintaining patient comfort and aesthetics. This approach is most effective in cases of mild to moderate transverse discrepancies and can help enhance smile aesthetics by broadening the dental arch.

IPR Technique

Interproximal reduction (IPR) is a technique used to create space and alleviate dental crowding by selectively removing a minimal amount of enamel between adjacent teeth. Various tools can be utilized for IPR, including burs, discs, and abrasive strips. In this study, a thin, diamond-coated, double-sided abrasive strip was employed for precise enamel reduction. The extent of reduction was carefully measured using an IPR gauge, and topical fluoride was applied afterward to minimize potential risks and enhance enamel protection [15,16].



Figure 1: Pre Treatment; Extraoral & Intraoral Photographs.

Treatment Progress

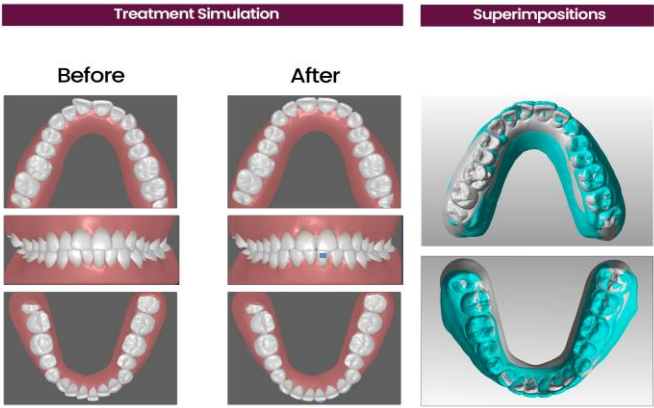


Figure 2: 3D Treatment Plan (A) Before & After, (B) Superimpositions.

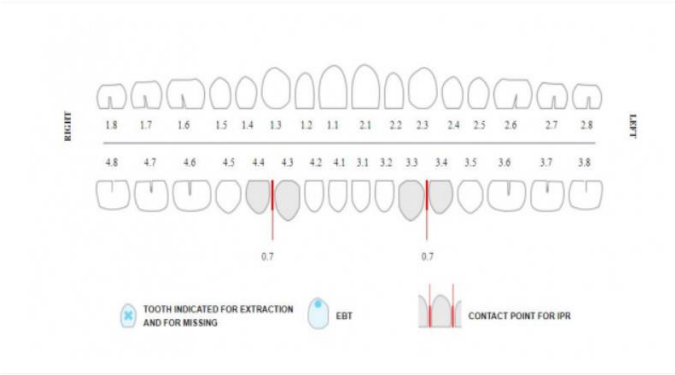


Figure 3: Ipr Form.

Upper Right								Upper Left								Lower Right								Lower Left									
Stg. #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Stg. #	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
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Dark lines indicate that IPR need to be done on this stage before inserting aligner

*Please use EST on specific tooth/teeth ONLY at the particular stage mentioned in MRF form.
*EST technique has to be used whenever "EXT" code is written.

Code	Movement Detail	Code	Movement Detail	Code	Movement Detail
MTR	Mesial Translation	MTP	Mesial Tipping	DTO	Distal Torque
DTR	Distal Translation	DTP	Distal Tipping	MTO	Mesial Torque
LTR	Lingual Translation	BTP	Buccal Tipping	INT	Intrusion
BTR	Buccal Translation	BTO	Buccal Torque	EXT	Extrusion
LTP	Lingual Tipping	LTO	Lingual Torque	DRO	Distal Rotation
				MRO	Mesial Rotation

Figure 4: Movement Record Form.



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

Treatment Result

The treatment was completed over a span of seven months, with each aligner worn for 22 hours daily and replaced every 10 days. By the conclusion of this period, the dental crowding and misalignment were effectively corrected. The patient achieved an ideal overjet and overbite, along with properly aligned teeth and a well-balanced, functional bite (Figure 5).

Additionally, the maxillary and mandibular arches were successfully aligned and centered, enhancing both the aesthetic appeal and functional efficiency of the patient's smile. Periodontal health was carefully monitored throughout the treatment, ensuring the absence of gum recession or periodontal pocket formation, thereby maintaining overall oral health.

Discussion

This case study assesses the effectiveness of ClearPath aligners in resolving dental crowding using a non-extraction approach. The findings underscore several key aspects of clear aligner therapy in orthodontic treatment. Clear aligners have become increasingly popular due to their aesthetic appeal, comfort, and removability, offering an alternative to traditional braces for patients who prioritize appearance during treatment. In this case, clear aligners effectively corrected malalignment and mild crowding while preserving periodontal health and achieving a stable occlusal relationship.

Clear aligners are widely recognized for their ability to address various orthodontic concerns, including spacing, crowding, and certain complex cases involving bite discrepancies [17]. Their capacity to exert precise, gradual forces makes them an effective tool for treating malocclusions [18,19]. In this case, the structured use of 20 stages of upper and lower aligners facilitated decrowding while maintaining proper tooth alignment. The scheduled aligner changes and continuous monitoring ensured steady progress and patient compliance.

The non-extraction approach was particularly advantageous in preserving the integrity of the dental arches while achieving the desired tooth movements. Techniques such as interproximal reduction (IPR) and arch expansion played a crucial role in resolving crowding without requiring extractions. This approach not only addressed the patient's primary concern but also minimized risks associated with more invasive procedures.

Maintaining periodontal health is a fundamental aspect of orthodontic treatment, and in this case, regular monitoring ensured that no adverse effects, such as gum recession or periodontal pocket formation, occurred. The success of the treatment can be attributed to both the patient's adherence to the prescribed aligner wear schedule and the precise planning of treatment stages. This highlights the significance of patient compliance in clear aligner therapy, as consistent wear and regular dental visits directly

influence treatment outcomes [20,21].

Despite the advantages of clear aligner therapy, certain limitations must be considered. While aligners are highly effective for mild to moderate crowding and alignment issues, they may be less predictable for complex movements such as significant rotations or large extrusions. In such cases, supplementary techniques or adjunctive treatments may be required to achieve optimal results. However, this case demonstrated that with meticulous planning and execution, clear aligners successfully resolved crowding within a relatively short treatment duration of seven months.

Conclusion

In conclusion, this case highlights the effectiveness of clear aligners as a reliable solution for addressing dental crowding, particularly when a non-extraction approach is preferred. Their discreet appearance, combined with the ability to preserve periodontal health, makes them a highly appealing option for adult patients seeking orthodontic treatment. Future research could further investigate the long-term stability of outcomes achieved with clear aligners and compare their efficacy with other orthodontic treatment modalities for similar 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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