

The Anticipated Outcome Of Clearpath Aligners In Resolving Crowding

Nasreen Nagani, Waqas Tahir, Sara Masood

Consultant Orthodontist, Dento Correct Clinic
Lahore, BDS, MDS-Orthodontics, Pakistan

Published: 16 November, 2023

The Anticipated Outcome of Clearpath Aligners in Resolving Crowding: A Case Report

Nagani N*, Waqas T and Masood S

*Consultant Orthodontist, Dent Correct Clinic Lahore, BDS, MDS-Orthodontics, Pakistan

Article Info

Article History:

Received: 31 October, 2023

Accepted: 07 November, 2023

Published: 16 November, 2023

***Corresponding author:** Nagani N,
Consultant Orthodontist, Dento Correct
Clinic Lahore, BDS, MDS-Orthodontics,
Pakistan; Email:
drnagani001@gmail.com;
DOI:
<https://doi.org/10.36266/JODHR/161>

Abstract

This case report is based on the clear aligner treatment of an adult patient who presented with moderate crowding and an unpleasant smile. Crowding was treated with arch expansion and interproximal reduction. A total of 28 sets of clear aligners were delivered, with a wear time of 22 hours per day for 10 days. The treatment duration was 10 months. Thus, the case study underscores the reliability of orthodontic treatment with clear aligners for addressing moderate crowding. The discreet nature of these aligners not only enhances periodontal health but also increases patient acceptance.

Copyright: © 2023 Nagani N, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Introduction

Clear aligners have demonstrated their versatility in addressing a range of malocclusions, including crowding, spacing issues, and teeth that are out of alignment. At the inception of clear aligners in orthodontics, their primary purpose was to address mild crowding. However, as materials and computer-aided tooth movement design have advanced, the scope of clear aligner applications has expanded to encompass moderate to severe crowding, whether they involve extraction or non-extraction approaches [1]. They can also be effectively utilized in cases involving open bite corrections and class III malocclusions [2]. Nevertheless, the effectiveness of aligners can vary depending on the complexity of the case and the specific tooth movements required. It's worth noting that the forces exerted by aligners are comparable to those produced by traditional fixed appliances [3,4].

Clear aligners can effectively address crowding issues through various methods, including proclining teeth, arch expansion, interproximal reduction (IPR), and, in severe cases, extraction, much like the techniques employed in traditional orthodontic treatments [5,6]. Nevertheless, it's important to note that in extraction cases, achieving pure translation movements with aligners may be less predictable when compared to other orthodontic approaches [7].

This case report is focused on utilizing clear aligner treatment to rectify a condition of moderate crowding in the patient's dentition. It aims to document the process, progress, and outcomes of this specific orthodontic treatment in addressing the crowding issue. The report will likely include details about the treatment plan, the application of clear aligners, the patient's response to the treatment, any challenges encountered, and ultimately, the success achieved in resolving the crowding problem. This information can

serve as a valuable reference for other practitioners and patients considering similar treatment for moderate crowding issues.

Case Report

A 29-year-old healthy male sought our dental services with concerns regarding tooth crowding and an unsightly smile. The patient's medical history was largely uneventful, except for a prior unsuccessful attempt at orthodontic treatment, which involved the extraction of a lower incisor. During the extraoral examination, we noted that the patient had a well-proportioned face, an orthognathic profile, competent lips, and an acute nasolabial angle. There were no reported symptoms or alterations related to the temporomandibular joint.

Upon smile analysis, we found that there was an adequate display of incisors, but the alignment of the teeth was suboptimal. Intraoral examination of the patient revealed Class I relationships for both molars and canines. The overjet (horizontal overlap of the upper and lower teeth) was excessive, while the overbite (vertical overlap of the upper and lower teeth) was within acceptable limits. Notably, the midline of the maxillary teeth deviated 1mm to the left of the patient's facial midline.

Intraorally, the patient exhibited moderate crowding in both the upper and lower dental arches, with 5mm of crowding in the maxilla and 6mm in the mandible. A panoramic radiograph confirmed that the patient had a healthy periodontal condition with no signs of cavities, root resorption, or any dental or pathological abnormalities. Additionally, cephalometric analysis revealed a skeletal Class I relationship and a normodivergent facial pattern.

Treatment Objectives

The primary goal of the orthodontic treatment was to address crowding concerns through the use of clear aligners. Secondary

goals included the establishment of a healthy, functional, and lasting occlusion, as well as the enhancement of dental aesthetics.

Treatment Options

We discussed various treatment choices with the patient, which included:

- The initial option involved traditional braces for orthodontic treatment. However, the patient declined this option due to their preference for a more aesthetic appliance.
- The second option was to use clear aligners, aligning with the patient's desire for a more esthetic solution.

Treatment procedure

Taking into account the patient's youthful age of 29 and his dynamic involvement as a speaker and active member of the social community, he preferred the clear aligner system. Consequently, we proceeded to gather intraoral and extraoral photographs, PVS impressions, panoramic X-rays, and lateral cephalometric records. These collected records were transmitted to the ClearPath facility for the formulation of a customised treatment plan.

The panoramic X-ray affirmed the presence of ample bone structure and showcased excellent oral hygiene, thereby meeting the essential criteria for orthodontic treatment. No further dental procedures were required, rendering the case suitable for the continuation of clear aligner treatment.

After submitting the records, a 3D treatment plan was generated. This plan involved 28 stages of treatment, including arch expansion and interproximal reduction (IPR) for both the upper and lower arches. A treatment simulation was presented to the patient for review, and upon their satisfaction, approval was granted.

The treatment plan was received and discussed with the patient within 10 days of the data submission. The patient expressed high levels of satisfaction with the proposed treatment plan, and no modifications were deemed necessary. A total treatment duration of 1 year and 2 months was recommended to the patient, which they readily approved. Consequently, treatment commenced shortly thereafter.

IPR Technique

Interproximal reduction is the technique of carefully removing the thin enamel layer interproximally between the neighbouring teeth to unravel crowding [8]. There are different methods of IPR, including burs, discs, and abrasive strips [9]. In this study, IPR was achieved using a thin diamond-coated double-sided abrasive strip. It was measured using an IPR gauge, followed by the application of topical fluoride to avoid any adverse effects.



Fig: (a) (b) (c)





Fig: (d) (e) (f) (g) (h)

Figure 1: Pre-Treatment Extraoral (A), (B), (C) & Intraoral Photographs (D), (E), (F), (G), (H).

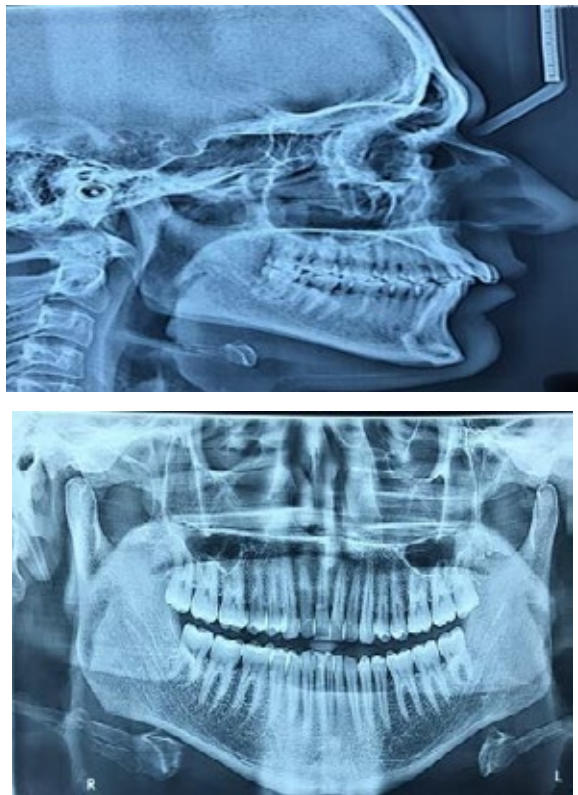


Figure 2: (A) Orthopantomograph (B) Lateral Cephalogram.

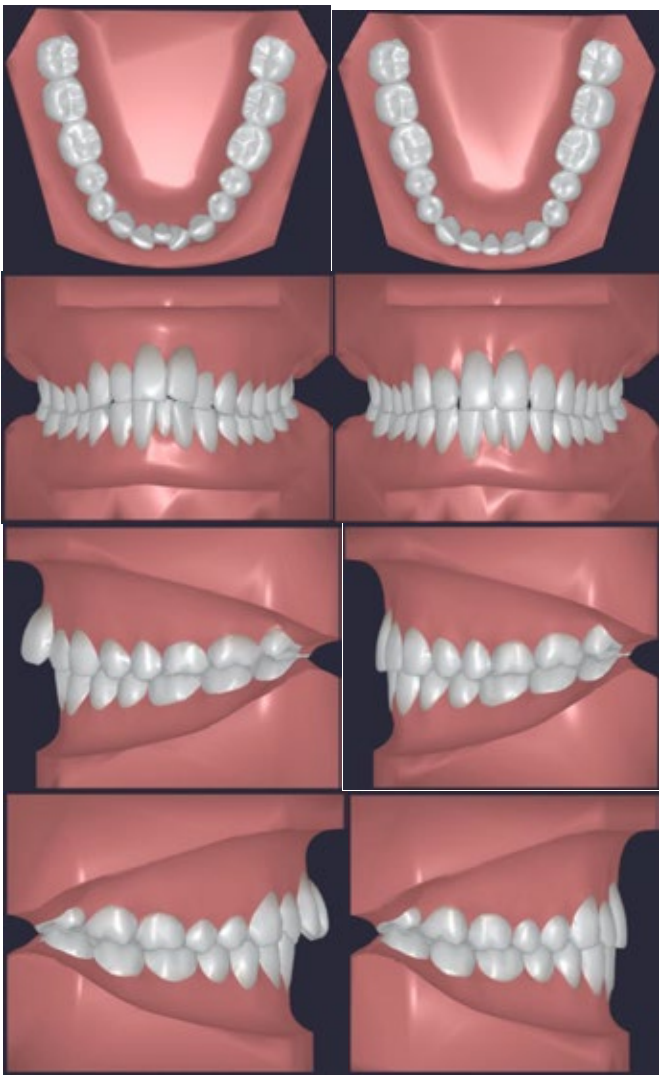


Figure 3: 3D Treatment Plan (A) Before (B) After.

Treatment progress

Treatment commenced in January 2020. Within two weeks, we received the IPR and MRF forms from the aligner facility, along with 28 sets of upper and lower aligners. The recommended wear time for each set was 22 hours per day for ten days. The patient received comprehensive guidance on oral hygiene and periodontal health. Initially, the patient was provided with the first set of aligners and was scheduled for an IPR appointment before starting the second set. We performed an IPR procedure, reducing 0.6mm between the upper laterals and canines bilaterally and 0.7mm between the upper canines and first premolars bilaterally. Subsequently, the patient received the next sets of aligners and was evaluated for periodontal health and aligner tracking every three months, with satisfactory results. An IPR visit was scheduled again after aligner 23, during which 0.6mm of enamel was removed between the upper left central and lateral incisors before providing the next batch of aligners. The patient demonstrated good compliance, and the treatment was successfully completed.

Following the treatment, two sets of retainers were issued. The

patient was instructed to wear them full-time for the first six months, followed by night-time wear for three months, and then alternate-night-time wear for the remaining three months.

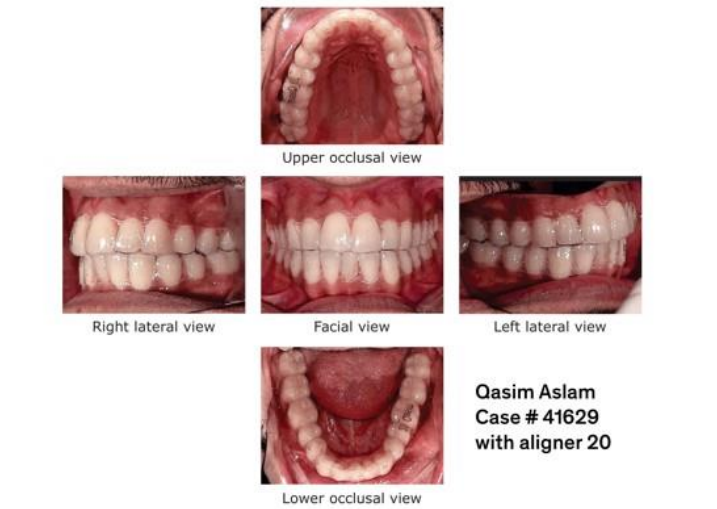


Figure 4: Mid Treatment Records, Aligners Fitting Well # 20.

Lower Right												Lower Left											
Stg. #	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17							
1																							
2							BTP					BTP											
3					BTP		BTR					BTR											
4					BTR		BTP					BTP											
5					BTP	BTP	BTP				BTP	BTR											
6					BTR	BTP	BTR				BTR												
7						BTR	BTP				BTP	BTP											
8				BTP			BTR				BTR	BTP											
9						BTP	BTP					BTR											
10				BTR				BTR			BTP	BTP											
11							BTP				BTR	BTP											
12							BTP	BTR			BTP	BTR											
13				BTP	BTP							BTP	BTP										
14				BTR			DTO				INT												
15							MRO	INT			MRO												
16						DRO		BTP			DRO		BTR										
17					BTR	DRO		BTR			MRO												
18					DRO		INT				MRO	INT											
19					DRO		BTP				MRO												
20				BTP	BTP						MRO		BTP	BTP									
21								INT			INT												
22					MRO		INT				INT												
23					MRO		MRO				MRO												
24						LTP	LTP	LTP			LTP	LTP											
25						LTP	LTP	LTR			LTP	LTP											
26					MRO		LTR	LTP			LTR	LTP											
27						LTR	LTP	LTR			LTP	LTP											
28						LTP	LTR	LTP			LTP	LTP											

Dark lines indicate that IPR need to be done on this stage before inserting aligner

Please use EDT on specific teeth/teeth ONLY on the particular stage mentioned in MRF form. EDT technique has to be used wherever "EDT" code is written.

Cod	Movement Detail	Cod	Movement Detail	Cod	Movement Detail
MTR	Mesial Translation	MTF	Mesial Tipping	DTO	Distal Torque
DTR	Distal Translation	DTP	Distal Tipping	MTQ	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
				MRC	Mesial Rotation

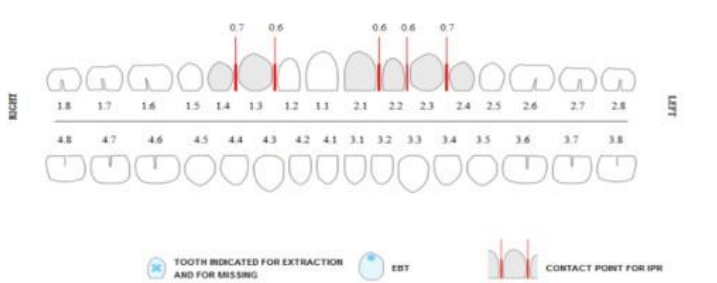


Figure 5: IPR Form.

Upper Right									Upper Left							
Stg. #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1																
2					MTP				BTP							
3					MTR				BTR		BTP					
4					BTP				BTP		BTR	MTP				
5								BTP	BTR		BTP	BTP				
6					BTP	BTR				DTP		BTR				
7								BTR	BTP			BTP	BTP			
8					BTR	BTP				DTR	BTP					
9							BTP	BTP					BTP	BTR		
10							BTP	BTR		BTR						
11						BTP		BTP		BTP	BTP					
12						BTR			MRO	BTP		BTR				
13						BTP	BTR		MRO					BTP		
14					BTP	BTP			MRO				BTP	BTR		
15								ORO								
16					BTP	BTR		BTP			BTR		BTR			
17					BTP	BTR		ORO			BTR	BTP				
18					BTR	BTP		ORO				BTR	BTP			
19						BTP	ORO	MTQ		DTP						
20					DTP	DTP		MTQ				DTP	DTP			
21						LTP	LTP	LTP	LTP	LTP						
22						LTR	LTP	LTR	LTP	LTR	LTP					
23						LTP	LTR	LTP	LTR	LTP	LTP					
24					DTP	DTR		LTP				DTP	DTR			
25								LTR	LTP	LTP	LTR					
26								LTP	LTP	LTP	LTR					
27								LTR	LTP	LTR	LTP	LTP				
28								LTR	LTP	LTR	LTP	LTP				

Lower Right								Lower Left								
Stg. #	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
1																
2							BTP					BTP				
3						BTP	BTR					BTR				
4						BTR	BTP					BTP				
5						BTP	BTP	BTP				BTP	BTR			
6						BTR	BTP	BTR				BTR				
7							BTR	BTP		BTP	BTP					
8						BTP		BTR		BTR	BTP					
9								BTP				BTR		BTP		
10						BTR			BTR		BTP	BTP				
11								BTP		BTR	BTP		BTR			
12								BTP	BTR		BTP	BTR				
13						BTP	BTP						BTP	BTP		
14						BTR								BTP		
15								ORO	INT		MRO					
16								ORO	BTP			ORO		BTR		
17						BTR	ORO		BTR		MRO					
18							ORO		INT		MRO	INT				
19							ORO		BTP							
20						BTP	BTP				MRO		BTP	BTP		
21									INT			INT				
22							MRO		INT		INT					
23							MRO		MRO		MRO					
24								LTP	LTP	LTP		LTP	LTP			
25								LTP	LTP	LTR		LTP	LTR			
26								MRO	LTR	LTP		LTR	LTP			
27									LTR	LTP	LTR		LTP	LTR		
28										LTR	LTP		LTR	LTP		

Dark lines indicate that IPR need to be done on this stage before inserting aligner

Please use EDT on specific teeth/teeth ONLY on the particular stage mentioned in MRF form. EDT technique has to be used wherever "EDT" code is written.

Cod	Movement Detail	Cod	Movement Detail	Cod	Movement Detail
MTR	Mesial Translation	MTF	Mesial Tipping	DTO	Distal Torque
DTR	Distal Translation	DTP	Distal Tipping	MTQ	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
				MRC	Mesial Rotation

Figure 6: Movement Record Form.

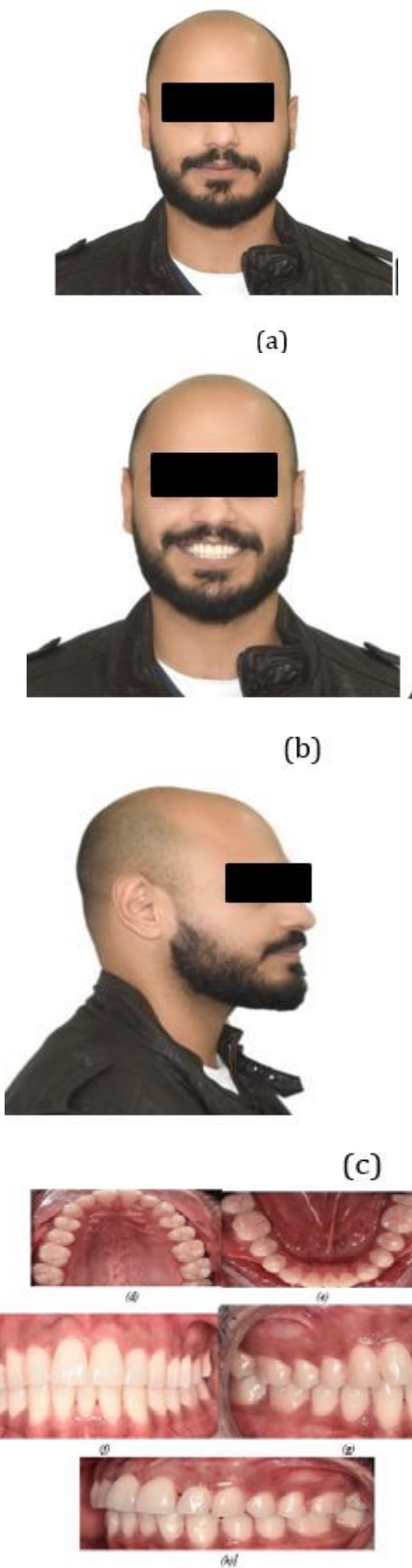


Figure 7: Post Treatment Records (A), (B), (C) Extra Oral (D), (E), (F), (G), (H) Intra Oral Photographs.

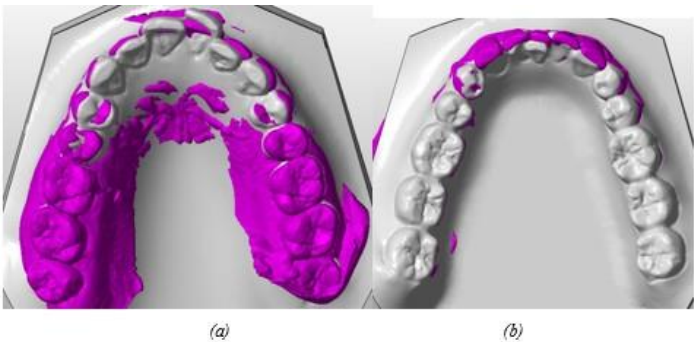


Figure 8: Superimposition Of Before & After Scans (A) Maxillary (B) Mandibular.

Treatment Result

The entire treatment course spanned a period of 10 months, with each aligner being worn for a substantial 22 hours per day and replaced every 10 days. By the conclusion of this treatment, the initial crowding issues were successfully addressed, leading to the establishment of Class I molar and canine relationships. The result was the achievement of an ideal overjet and overbite, ensuring proper alignment and bite function. Furthermore, the treatment concluded with the harmonious centering of the maxillary and mandibular midlines, enhancing both the esthetic and functional aspects of the patient's smile. Importantly, the periodontal health was carefully maintained throughout the treatment, with no evidence of gum recession or the formation of periodontal pockets, ensuring the overall well-being of the patient's oral health.

Discussion

The aim of this study was to evaluate the reliability of resolving crowding issues, the effectiveness of various space-gaining techniques, and their interrelationships in order to establish a dependable protocol for achieving predictable outcomes. In this specific case involving moderate crowding, clear aligners were successfully employed over a duration of 10 months. Crowding was alleviated through a combination of arch expansion and interproximal reduction. A total of 28 sets of aligners were provided for both the upper and lower arches. While alternative treatment options were presented to the patient, they opted for clear aligners due to their discreet, hygienic, and comfortable nature. Clear aligners represent a unique treatment approach for adult orthodontic patients, addressing aesthetic, hygiene, and metal allergy concerns while offering a treatment duration comparable to traditional fixed appliances [10]. In clear aligner treatment, patient compliance is of paramount importance. Patient education can serve as a motivational tool, influencing patient acceptance of the appliance and improving compliance [11]. In this case, the patient's active involvement and interaction with their orthodontist significantly contributed to the treatment's success. The patient was engaged with the ClinCheck software, which visually demonstrated the anticipated tooth movement and progress throughout the treatment. This

underscores the value of ClinCheck as an educational tool to illustrate the final treatment objectives to the patient.

However, it is worth noting that the clear aligner system does have certain limitations. It may be less predictable in cases involving severe derotations, complex extrusions, or significant translations, which might necessitate additional treatment modalities [12]. Despite potentially higher laboratory fees compared to conventional appliances, the virtual treatment setup, ease of use, and high patient acceptance can often offset the additional cost. This setup not only aids in diagnosis but also serves as an educational tool for patients. Furthermore, patient cooperation is crucial for the overall success of the treatment, which, in this case, was excellent due to the patient's enthusiasm for the process.

Conclusion

In summary, this case study underscores the reliability of orthodontic treatment with clear aligners for addressing moderate crowding. The discreet nature of these aligners not only enhances periodontal health but also increases patient acceptance. Moreover, the precise control of orthodontic movements with minimal risk of losing anchorage makes it a compelling option for clinicians when managing moderate crowding cases.

Consent & Conflict of Interest

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

References

1. Ke Y, Zhu Y, Zhu M. A comparison of treatment effectiveness between clear aligner and fixed appliance therapies. *BMC Oral Health*. 2019; 19: 1-10.
2. Boyd R. Complex orthodontic treatment using a new protocol for the Invisalign appliance. *J Clin Orthod*. 2007; 41: 525-47.
3. Simon M, Keilig L, Schwarze J, Jung BA, Bourauel C. Forces and moments generated by removable thermoplastic aligners: incisor torque, premolar derotation, and molar distalization. *Am J Orthod Dentofacial Orthop*. 2014; 145: 728-36.
4. Castrolfiorio T, Gambero EF, Caviglia GP, Deregibus A. Biochemical markers of bone metabolism during early orthodontic tooth movement with aligners. *Angle Orthod*. 2017; 87: 74-81.
5. Buschang PH, Ross M, Shaw SG, Crosby D, Campbell PM. Predicted and actual end-of-treatment occlusion produced with aligner therapy. *Angle Orthod*. 2015; 85: 723-7.
6. Robertson L, Kaur H, Fagundes NCF, Romanyk D, Major P, Flores MC. Effectiveness of clear aligner therapy for orthodontic treatment: a systematic review. *Orthod Craniofac Res*. 2020; 23: 133-42.
7. Dai F, Xu T, Shu G. Comparison of achieved and predicted crown movement in adults after 4 first premolar extraction treatment with Invisalign. *Am J Orthod Dentofac Orthop*. 2021; 160: 805-13.
8. Meredith L, Li M, Cannon RD, Farella M. Interproximal reduction in orthodontics: why, where, how much to remove? *Aust Orthod J*. 2017; 33: 150.
9. Lapenaite E, Lopatiene K. Interproximal enamel reduction as a part of orthodontic treatment. *Stomatologija*. 2014; 16: 19-24.
10. Boyd RL, Miller RJ, Vlaskalic V. The Invisalign system in adult orthodontics: mild crowding and space closure cases. *J Clin Orthod*. 2000; 34: 203-213.
11. Serogl HG, Klages U, Zentner A. Pain and discomfort during orthodontic treatment: causative factors and effects on compliance. *Am J Orthod Dentofacial Orthop*. 1998; 114: 684-691.
12. Boyd RL, Waskalic V. Three-dimensional diagnosis and orthodontic treatment of complex malocclusions with the Invisalign appliance. *Semin Orthod*. 2001; 7: 274-93.