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USE OF THE PENDULUM APPLIANCE IN MANAGING CLASS II MALOCCLUSION WITH MIDLINE DISCREPANCY: A CASE REPORT

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Abstract

The management of Class II malocclusions accompanied by midline deviation requires individualized approaches that balance treatment effectiveness with patient tolerance to orthodontic appliances. The Pendulum appliance is a fixed orthodontic device known as an effective and reliable method for maxillary molar distalization.

This case report aims to describe the orthodontic treatment of an 11-year-old female patient presenting with a Class II malocclusion, midline deviation, and ectopic canine position on one side, using the Pendulum appliance. The treatment goal was to achieve controlled unilateral distalization to correct the midline shift.

Following clinical and radiographic evaluations, a four-phase treatment protocol was followed for approximately three years: molar distalization with the Pendulum appliance, spontaneous distalization of the premolars, space maintenance using a transpalatal (Nance) appliance, and finally, placement of fixed brackets. During treatment, the patient reported persistent discomfort due to the palatal component of the Pendulum, which caused oral hygiene challenges and mucosal irritation.

The Pendulum appliance proved to be an effective solution for correcting a Class II malocclusion and midline deviation in a growing patient. However, appliance selection should always be based on individual diagnosis, considering the type of malocclusion, patient age, and expected compliance. Further long-term studies with larger patient samples are needed to assess the stability of outcomes achieved with the Pendulum, especially in cases involving midline correction.

Keywords: *Pendulum, malocclusion, midline deviation, molar distalization, orthodontic treatment*

Introduction

One of the most typical orthodontic problems is class II malocclusion. Dental asymmetries are frequently linked to midline deviation, which can present treatment-related functional and aesthetic difficulties. The Pendulum appliance is a popular choice in clinical practice because it is a fixed intraoral device that delivers constant force without requiring patient cooperation. [1]

The Pendulum is a fixed orthodontic appliance, developed by James J. Hilgers in 1992, [2] which uses force to distalize the upper first molars to create space for impacted teeth to erupt or to allow for the correction of Class II malocclusion. Hilgers published an article in the Journal of Clinical Orthodontics in

1992 describing the appliance. [3] The Pendulum appliance uses a large Nance-type acrylic button for anchorage to the palate and 0.032" thick TMA springs to exert a light and continuous force on the upper first molars, without affecting the palatal button. This appliance creates a wide arch of force from the mid-palate to the upper molars. [4]

The Fixed Pendulum/Expansion Appliance (FPAE) is comprised of rings (bands) around the maxillary (upper) permanent first molar teeth, stainless steel occlusal rests (wires) that sit passively in the grooves of the middle teeth, composite resin (dental glue made from the same material as sealant or filling material) that helps to anchor the appliance, an acrylic (plastic) frame that sits on the roof of the mouth, an expansion mechanism in the midline, and springs that attach to the bands. [5]

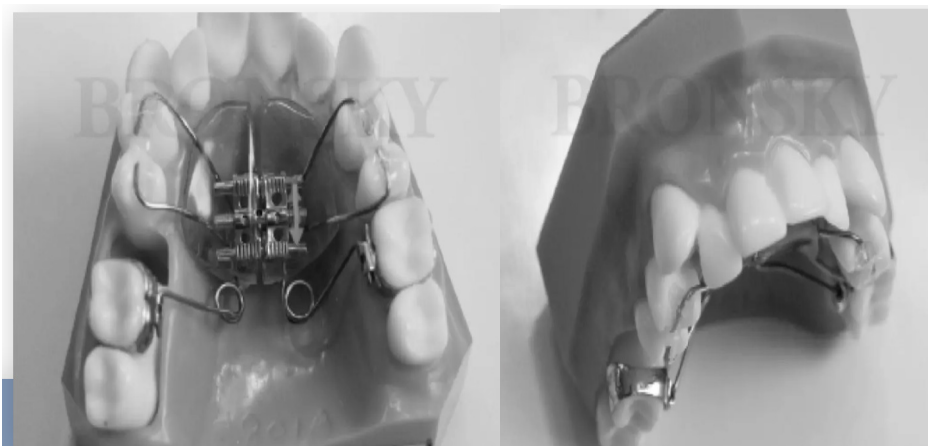


Figure 1.1. The Pendulum appliance design

The Pendulum appliance performs the same basic function as the ACCO appliance in that it is intended to distalize molars. Aside from other design differences, there are 2 features that set the Pendulum Appliances apart. The Pendulum is a fixed appliance with pre-activated springs. Since the patient cannot take it out, it applies force to the molars all of the time. The wire used to make the springs also has a great deal of what is referred to as “memory”, meaning it tends to spring back to its original shape. This prevents the clinician from having to make frequent adjustments to the springs. [6] The Pendulum appliance has good patient tolerance. It is a very effective method of correcting Class II malocclusion with little patient cooperation and without the need for extractions. It requires little laboratory assistance and is straightforward to produce. The price of commercially accessible molar distalization appliances is far more than that of a Pendulum appliance. In a busy clinical practice, it can be utilized frequently. [7]

Objective of the study

The aim of this study is to present, through a case report, orthodontic treatment with a Pendulum appliance in a patient with midline deviation and dental class II.

Materials and Methodology

Patient V.C., an 11-year-old female, presented to “Unica Dental Clinic” with aesthetic and functional concerns, including midline deviation and ectopic eruption of a canine. A comprehensive clinical examination was conducted, and all findings were recorded in the patient’s medical file. Radiographic assessment included both panoramic and lateral cephalometric imaging. Intraoral and extraoral photographs were taken and documented throughout the various phases of treatment.

The treatment protocol consisted of the following phases:

Phase I: Distalization of the upper molars using a Pendulum appliance

Phase II: Spontaneous distalization of the premolars

Phase III: Maintenance of molar position with a transpalatal arch

Phase IV: Placement of fixed appliances (brackets)

The main treatment objectives were focused on improving facial aesthetics, achieving a molar Class III relationship to allow overcorrection, and controlled distalization of teeth on the left side to correct the midline deviation.

This study was conducted following ethical standards for clinical practice. The use of patient data was authorized through informed consent. All personal information was handled confidentially and anonymously.

Results and Discussions

The 11-year-old female patient presented with both aesthetic and functional concerns. Extraoral clinical examination revealed a mesofacial profile with no evident skeletal asymmetry.

Figure 1 illustrates frontal facial views at rest and during smiling, as well as right and left profile views.

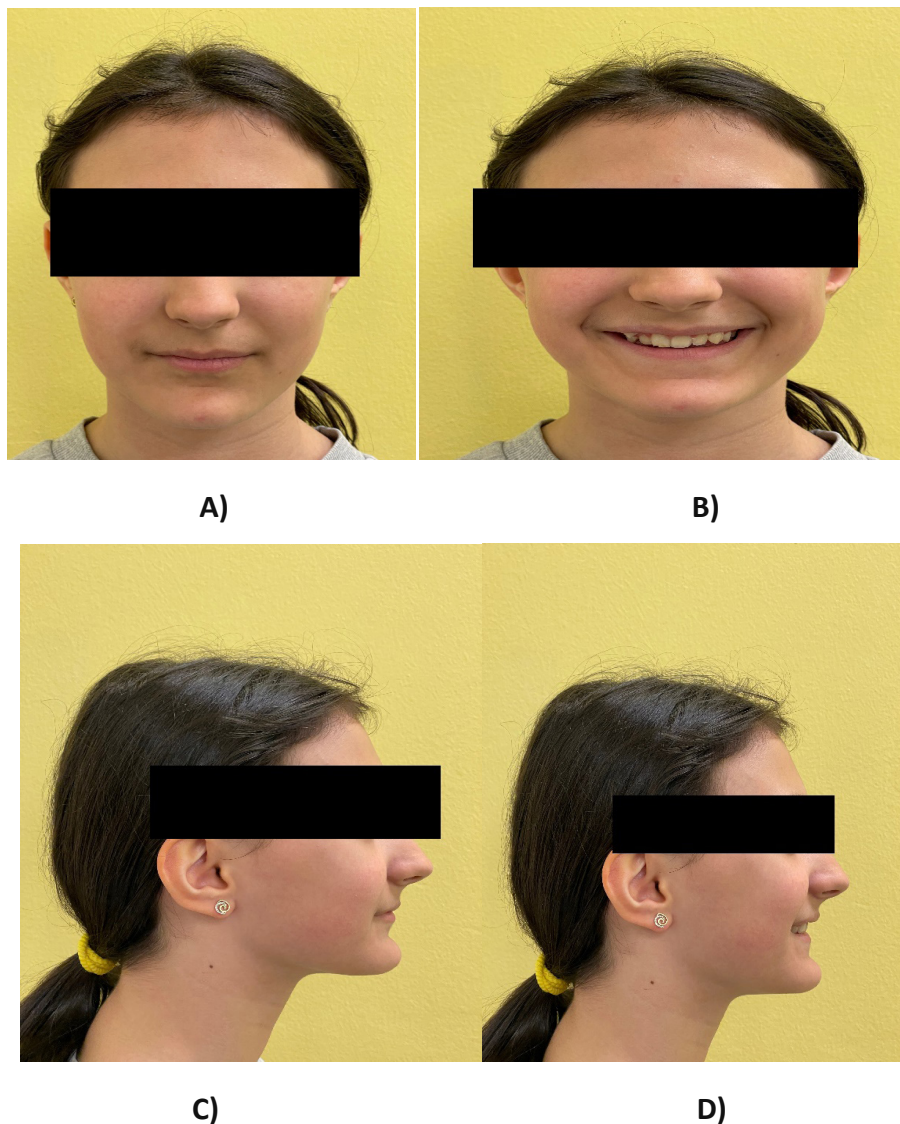


Figure 4.1 (A, B, C, D): Pre-treatment Extraoral Photographs

Intraoral examination revealed a midline deviation, a dental Class II malocclusion, and an ectopic position of the canine in one of the arches.

Figure 2 illustrates these findings through pre-treatment photographs, including frontal view in maximum intercuspation, right and left lateral views, and an occlusal view of the upper arch.

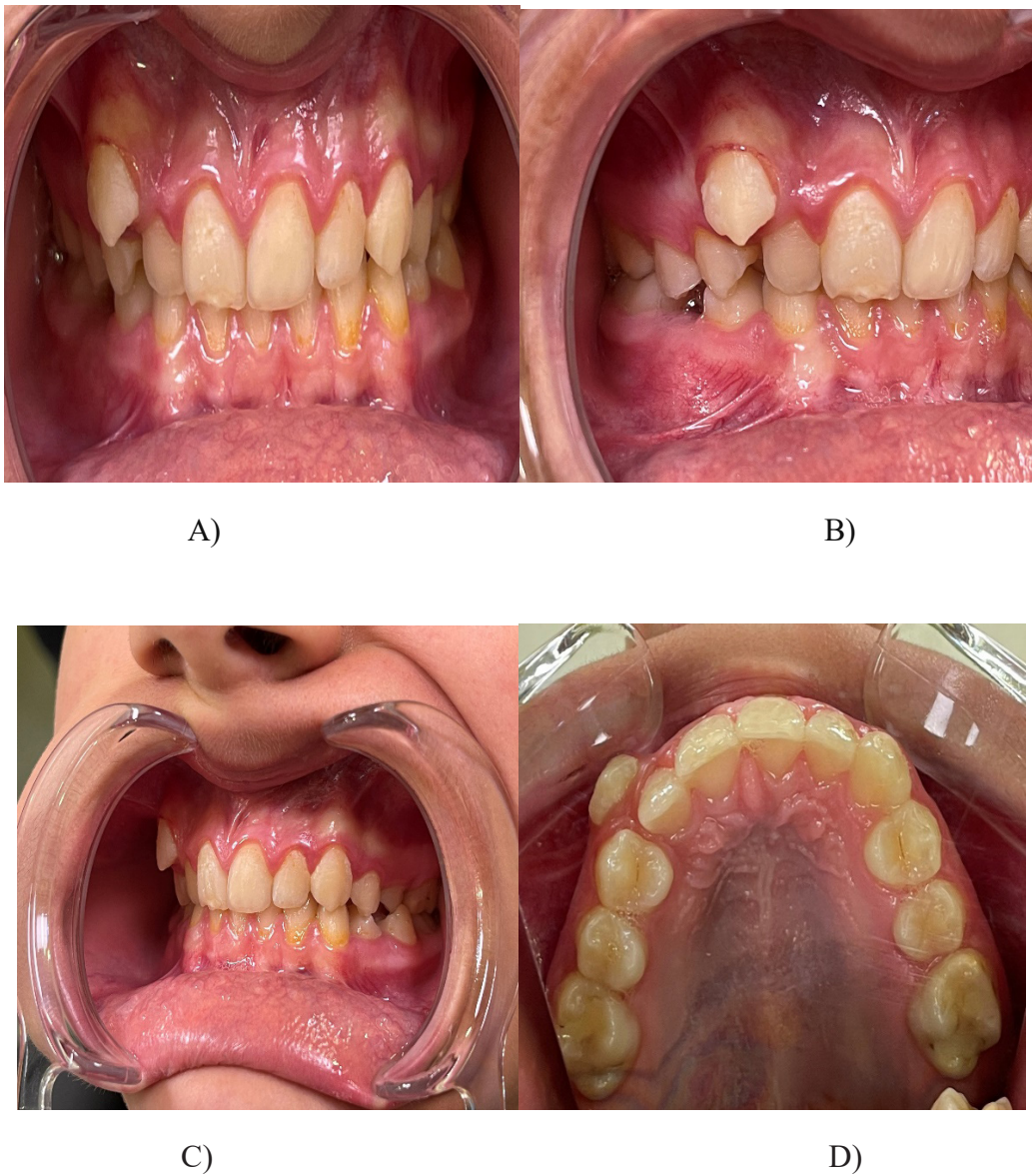


Figure 4.2 (A, B, C, D): Pre-treatment Intraoral Photographs

Radiographic evaluations included panoramic radiographs and a cephalometric analysis, both aesthetic and skeletal. Cephalometric analyses showed a balanced skeletal ratio in the sagittal aspect ($ANB = 2^\circ$), but an imbalance in the vertical aspect with a decrease in the SN/Go-Gn and ANS-PNS/Go-Gn parameters, suggesting a low vertical growth pattern. Dental parameters showed the presence of a slight protrusion of the upper lip and a relatively neutralized position of the upper and lower incisors.

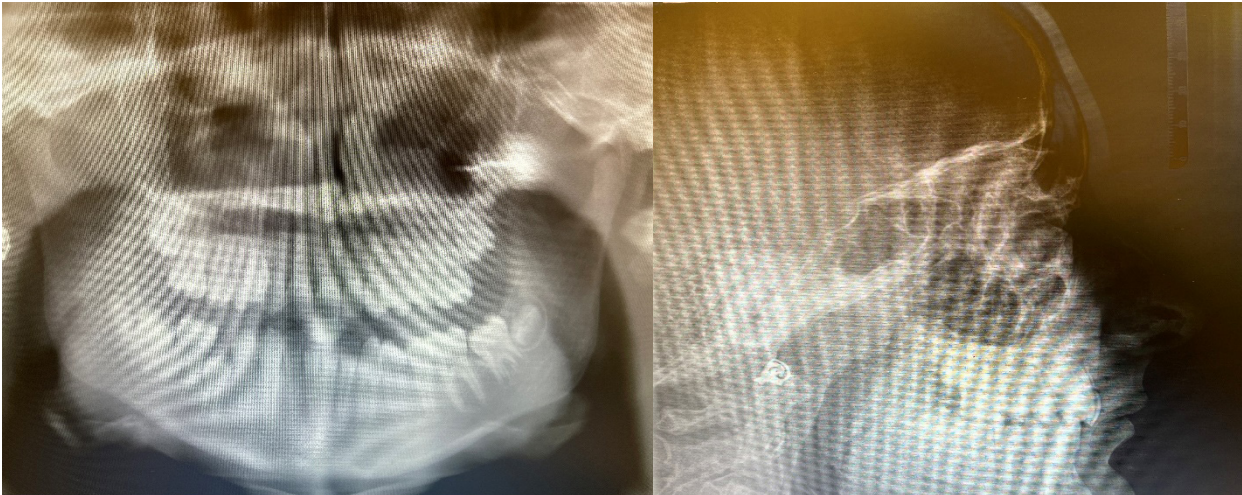


Figure 4.3. Pre-treatment Panoramic Radiograph

Table 4.1. Esthetic Cephalometric Analysis

Measurement for female	VM	DS	PZ
Soft tissue A point (A'-TVL)	-0.1	1.0	+1
Upper lip anterior (ULA-TVL)	3.7	1.2	+11
Upper incisor tip (Mx1-TVL)	-9.2	2.2	-2
Lower incisor tip (Md1-TVL)	-12.4	2.2	-6
Lower tip anterior (LLA-TVL)	1.9	1.4	9
Soft tissue B pont (B'-TVL)	-5.3	1.5	2
Soft tissue Pog (Pg-TVL)	-2.6	1.9	10

Table 4.2. Skeletal Cephalometric Analysis

Sagittal Analysis

SNA	82	82 +/-2
SNB	80	80 +/-2
ANB	2	2 +/-2
WITS	4	0 +/-2

Vertical Analysis

FMA	27	25 +/-3
SN/Go-Gn	26	32 +/-5
SN/ANS-PNS	7	7 +/-3
ANS-PNS/Go-Gn	16	25 +/-5
ArGoMe	124	130

Dental Analysis

U1/PF	101	105-110
IMPA	90	94 +/-5
L1/A-Pg		2 +/-2 mm
OVb mm	3	2.5 +/-2.5 mm
OVJ mm	3	2.5 +/-2.5mm

Following radiographic evaluation, a decision was made to initiate treatment using the Pendulum appliance. A major challenge was the controlled distalization of teeth on the left side in order to correct the midline deviation. This required the application of light forces and extended treatment time. Figures 5 and 6 present intraoral and extraoral photographs taken during treatment. A four-phase treatment protocol was followed to successfully manage the case. Phase I was the distalization of Upper Molars with the Pendulum Appliance. The Pendulum appliance was placed, and the distalizing springs were activated monthly to achieve overcorrection. The patient reported discomfort primarily during the use of the Pendulum, particularly due to the anchorage component resting on the palate. This part of the appliance was associated with hygiene difficulties, food accumulation, and mucosal irritation, leading to continuous discomfort. In the second phase, after achieving overcorrection, the second premolar was deactivated, and spontaneous distal movement was awaited, relying on periodontal ligament forces. Once sufficient movement occurred, the first premolar was also deactivated, and observation continued for spontaneous repositioning. In the third phase to maintain the achieved molar position, a transpalatal Nance appliance was used. While the Nance button was being fabricated in the laboratory, a temporary retainer was used for one week. Once fabrication was complete, the Nance button was cemented in place.

In the final stage of treatment fixed orthodontic appliances were placed. Bonding of the upper arch brackets was performed after cementation of the Nance appliance. The lower arch had been bonded earlier during the Pendulum activation phase.

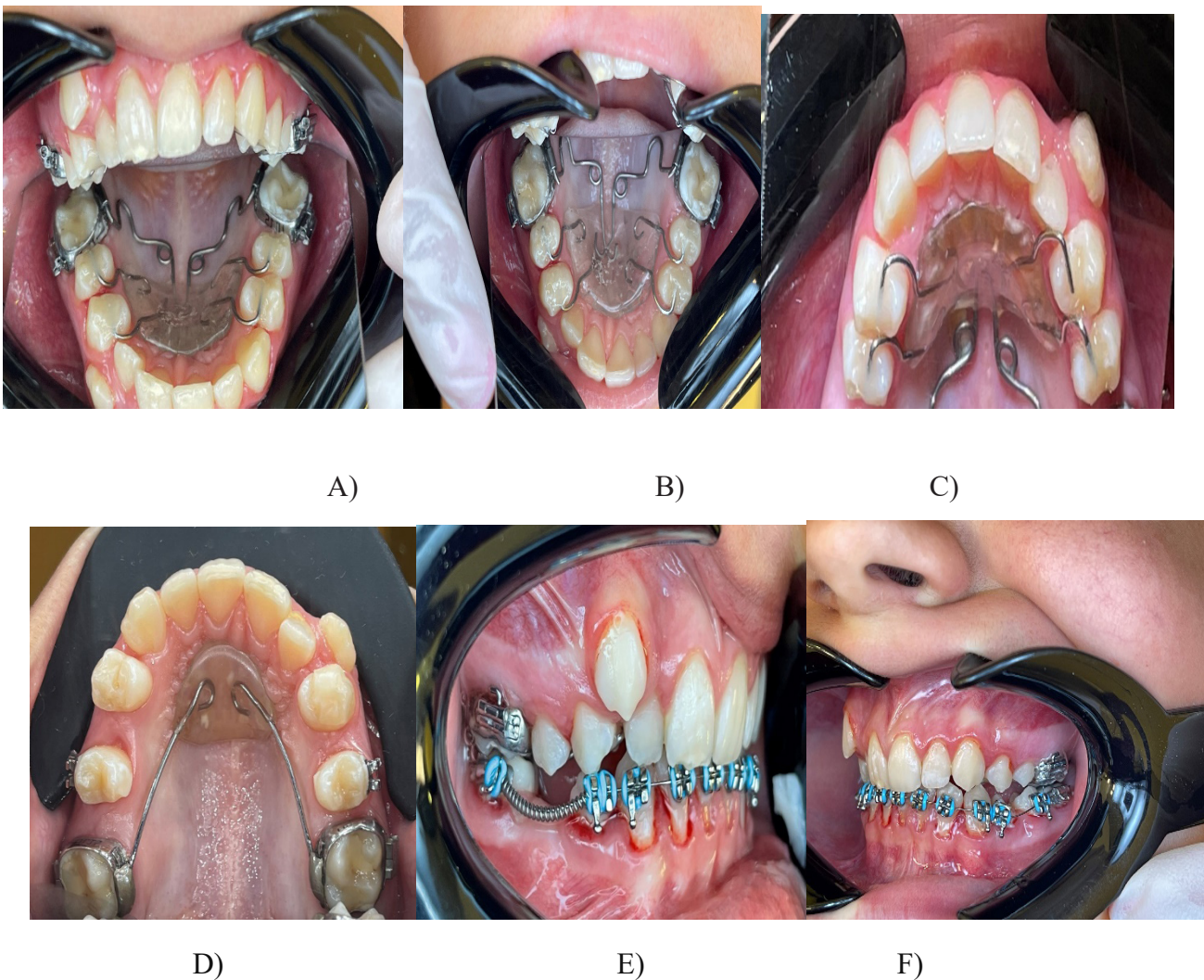


Figure 4.4 (A, B, C, D, E, F): Clinical intraoral photographs from treatment Phases I-III.

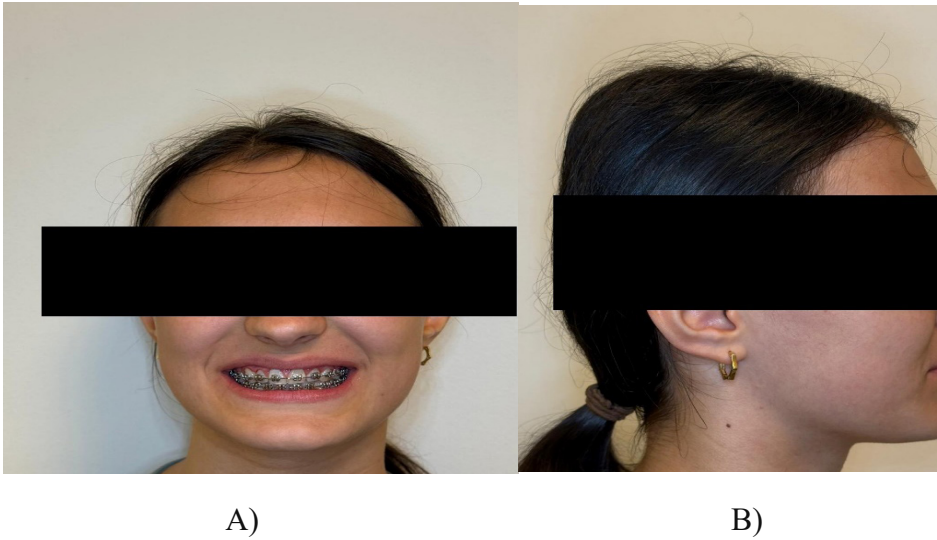


Figure 4.5 (A,B): Extraoral images during the final stage (Phase IV) of treatment, close to treatment completion.

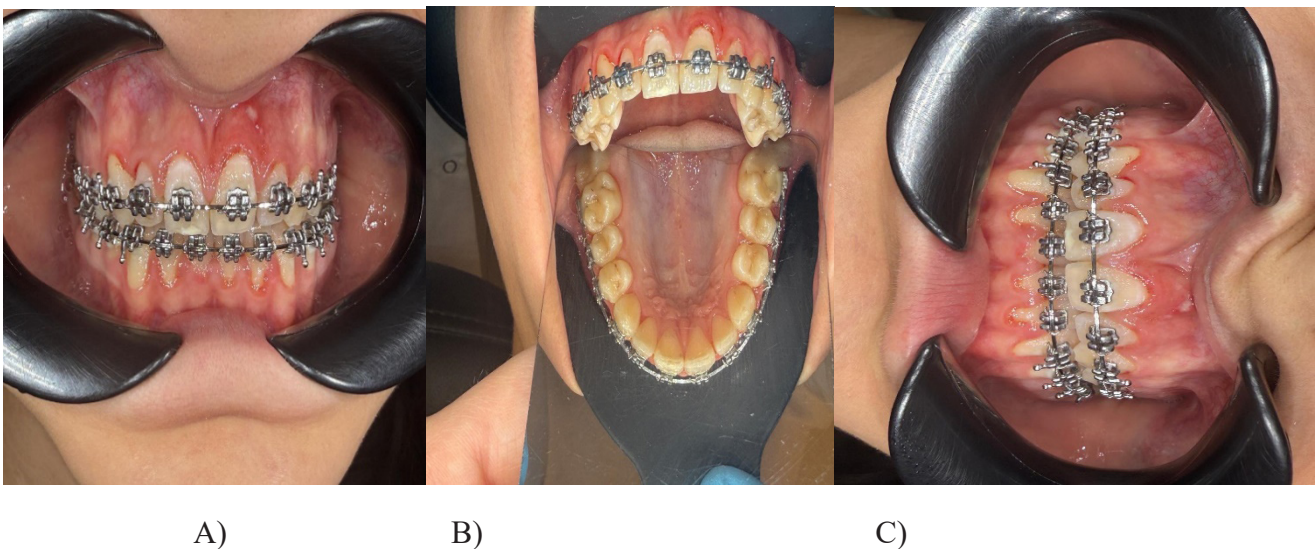


Figure 4.6 (A, B, C): Intraoral images during the final stage (Phase IV) of treatment, close to treatment completion.

Photographs taken before and during treatment (Figures 1–6) document the patient's aesthetic and dental progress. The results indicate a significant improvement in midline symmetry, the establishment of a more favorable inter-arch relationship, and enhancement of lip and profile aesthetics. The total treatment duration was approximately three years, primarily due to the need for controlled unilateral distalization and careful midline correction without the use of excessive forces.

Similar results were found in other case studies. In the study by Wang et. al. [8] involving a 13-year-old female patient, the findings showed that the pendulum appliance is an effective and reliable method for distalizing maxillary molars. These findings are also supported by the systematic review conducted by Al-Thomali Y. [9]

Wang pointed out during the study that the major advantages of the appliance lie in its minimal dependence on patient compliance, ease of fabrication, allowing correction of minor transverse and vertical molar positions by adjustment of the springs and, last but not least, patient acceptance. [8] Our study also confirmed many of these advantages.

Concluzions and Recommendations

The Pendulum appliance proved to be an effective solution for correcting a Class II malocclusion and midline deviation in a growing patient. However, appliance selection should always be based on individual diagnosis, considering the type of malocclusion, patient age, and expected compliance. Further long-term studies with larger patient samples are needed to assess the stability of outcomes achieved with the Pendulum, especially in cases involving midline correction.

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