

Bilateral Premolar Intrusion Due To Activation Of Hawley's Retainer: A Case Report

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Abstract

The article reports a rare case where an orthodontically treated patient's self-intervention to tighten her Hawley's retainer resulted in the bilateral intrusion of maxillary second premolars emphasizing the importance of passively designed retainers with thorough counselling of the patient about the possible sequelae of interference with the design of the appliance at home.

Keywords: *D-I-Y dentistry; complication; Hawley's retainer; intrusion*

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I. Introduction:

The fundamental need for retention after orthodontic therapy has been extensively recognized by clinicians due to the unavoidable changes taking place post-treatment in patients. Over the years, various retainers have been suggested to suit individual needs and operator's pick that can be given to the patient for a decided duration. While fixed lingual retainers have been the retainer of choice in the mandibular arch, Hawley's retainers remain the most commonly used retention appliance for the maxillary arch. It is common to find patients falling prey to Do-It-Yourself dentistry to make up for the needed clinical intercession during the retention phase. The article reports one such case where an orthodontically treated patient's self-intervention to tighten her Hawley's retainer resulted in the bilateral intrusion of maxillary second premolars.

Case description:

Patient Information and History of Previous Treatment:

A 17-year-old female patient reported to the orthodontic department in March 2023 for a follow-up appointment post-completion of orthodontic treatment with a chief complaint of increasing irregularity of teeth in the upper back tooth region. The patient had previously been treated in the same institute for a diagnosis of bimaxillary dentoalveolar protrusion with all four premolar extraction followed by fixed orthodontic mechanotherapy with preadjusted edgewise appliance (Fig 1). The treatment took 20 months to complete and ended in February 2022. At the end of the active treatment, the patient had been given Hawley's retainer in the maxillary arch and a fixed lingual retainer in the mandibular arch. She had failed to keep up with the follow-up appointment. Currently, the patient presented with a good general state of health with a non-significant medical history.



Figure 1: Previous Post-treatment Records

Clinical Findings:

On extraoral examination, the patient displayed a symmetrical mesoprosopic face with a straight profile and competent lips (Fig 2). Smile analysis showed an average smile line with a consonant smile arc and wide buccal corridors. On intraoral examination, the patient revealed bilateral intrusion of maxillary second premolars alongside mesial tipping of 1st maxillary molar crown on both sides (Fig 2). An End-on Molar relation was noted along with an overjet and overbite of 1 mm. A lack of proper intercuspation of the posterior segments and a shift of the maxillary midline to the left by 1 mm was observed. The maxillary occlusal view revealed a distolingual rotation as well as extrusion of the maxillary canines and gingival inflammation on the lingual aspect of maxillary anterior teeth. The mandibular occlusal view displayed a well-aligned arch with an intact lingual retainer and no noticeable changes in comparison to the retrieved post-treatment intraoral records (Fig 1). The patient was wearing an over-activated Hawley's retainer at the time of reporting to the clinic and on investigating confessed to self-activation of the retainer. She admitted having acquired the mechanics of activation of the labial bow during her time as a patient by observing her practitioner. Radiographic investigations including intraoral periapical radiographs of the maxillary premolar region, orthopantomogram and a cephalogram were advised and study models were prepared (Fig 3,4). IOPA radiographs showed normal periodontal support concerning both intruded premolars with no clinically significant root resorption (Fig 3). OPG revealed erupting maxillary and mandibular third molars (Fig 3). Cephalometric analysis findings are summarized in Table 1.



Figure 2: Extraoral and Intraoral Photographs at the time of presentation to the clinic with and without retainer

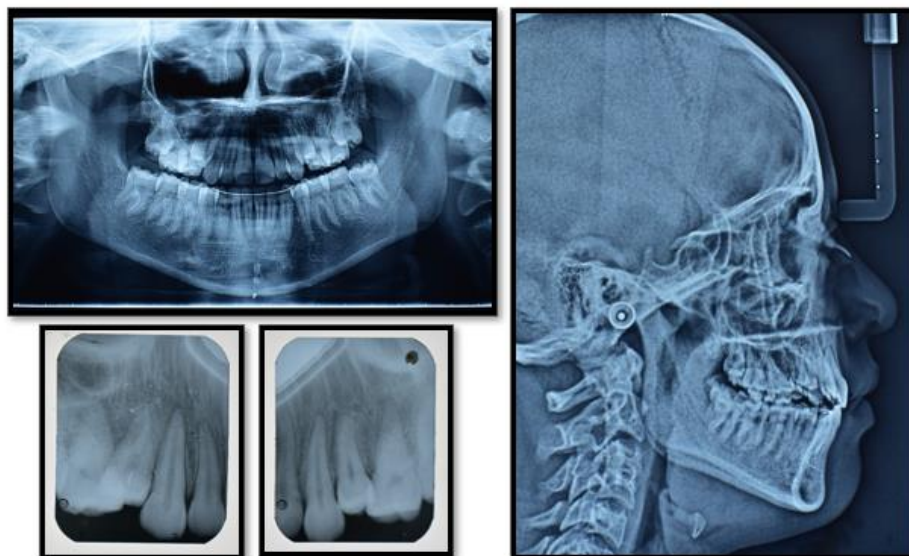


Figure 3: Present Radiographic Investigations

Treatment Intervention:

Immediate discontinuation of Hawley's retainer to be followed by retreatment through a fixed orthodontic appliance in the maxillary arch for allowing extrusion of the premolar and establishing proper intercuspation was decided.



Figure 4: Study Models

II. Discussion:

This case report aims to highlight the hazard of improper mechanics and force systems that can develop due to self-intervention by the patients in the absence of proper follow-up even after completion of treatment. Retention of the post-treatment results is as important as the treatment itself if not more. The fact that retaining a good result depends to a large extent on a patient's compliance with proper recall visits makes it all the more difficult. Missed appointments and inability to follow up lead to breakages causing anchorage loss, unwanted tooth movement, ulcerations, disengagement of wire and other such mishaps. One such case is presented in this article.

Retainers can be broadly divided into two groups: fixed and removable.¹ There has been inconclusive evidence regarding a proper duration of retention regimen needed for different patients. Consequently, clinicians have a preference to retain for as long as possible, sometimes indefinitely. According to a recent Cochrane Review on retention methods, there is insufficient high-quality evidence to determine the optimal type of retainer or retention regimen.² The choice of retention protocol thus depends largely on operators' choice, patient expectations and cost factors.

VARIABLES	PREVIOUS POST TREATMENT VALUES	PRESENT VALUES
SNA	83°	83°
SNB	79°	79°
ANB (3.12°±1.8°)	4°	4°
Wits (-0.01mm)	0 mm	0 mm
FMA (23.83±2°)	27°	28°
SN-MP (32-35°)	34°	35°
Y Axis (53-66°)	61°	63°
Bjork's sum (394°)	(126+153+116) =395°	(125+154+117) =396°
J ratio (59-63%)	62.5 %	62.2 %
Gonial angle (123°)	116 °	117 °
Mx 1 to A-Pg: 6.74±1.3mm	8.2 mm	5.8 mm
Mx 1 to NA: 4.92±2.05mm	3.5 mm	0 mm
Mx 1 to NA: 24.02±5.82°	19 °	9°
Mx 1 to Palatal Plane (71°)	70 °	81 °
Md 1 to A-Pg (-2mm to 2mm)	3.5 mm	3.5 mm
Md 1 to NB (6±1.7mm)	6.4 mm	5.88 mm
Md 1 to NB (27±4.3 °)	28°	26°
IMPA	92°	91°
Inter-incisor Angle (123°)	130°	141°
Nasolabial angle	84°	87°
Inter labial gap	0 mm	0 mm
Lip strain	0 mm	0 mm
Upper lip w.r.t. E-line (-4mm)	0 mm	-1.1 mm
Lower lip w.r.t. E-line (-2 mm)	0 mm	+ 1.1 mm
Upper lip w.r.t. S-line (0 mm)	+2.3 mm	+2.3 mm
Lower lip w.r.t. S-line (0 mm)	+1.1 mm	+2.3 mm

Table 1 : Cephalometric Findings

Vacuum-formed retainers (VFRs) outperform Hawley retainers in terms of patient satisfaction and speech articulation but Hawley retainers have been shown to achieve better occlusal contacts by allowing relative vertical settling of teeth.^{3,4,5} Thus, in the present case, Hawley's removable retainer plate was selected as a retention device in the maxillary arch for the patient to allow for functional settling of occlusion after debonding which would not be possible if thermoplastic retainers were given owing to their interposition in the buccal segments. Other advantages like durability, resistance to staining and easy hygiene maintenance were kept in mind while choosing this particular type.² The design of the retainer included a long labial bow extending from 1st premolar of one side to the other and two C-clasps resting on the 1st molars embedded in a clear acrylic plate covering the anterior palate. When activated by the patient, through closing the loops of the labial bow, the retainer produced a force system wherein, the labial bow produced a retracting force on the maxillary anterior teeth and the C clasps engaging the 1st molars formed the anchorage unit against which this retraction force was acted upon. These reciprocal forces produced on the maxillary molars and maxillary anterior teeth caused an equal and opposite reaction with the anterior teeth moving distally and molars moving mesially (Fig 5). As the loop of the labial bow was located buccal to the 2nd premolars and the acrylic plate lingual to it, the movement of the premolars was restricted in the buccolingual direction leaving it to travel in a vertical plane due to the applied forces. The loop itself acted like a guiding plane throughout the intrusion of the premolar. The possible explanation as to why the premolars intruded rather than extruding could be the presence of the interdental crossing wire of the labial bow in the premolar region and the very presence of occlusal forces which seemed to have an effect as the patient would complain of having to close the bite forcefully to keep the retainer seated when the retainer stopped fitting her due to activation. The moments generated due to these forces caused the mesial tipping of the 1st molar and the distal tipping of the anterior teeth. As seen in Table 1, the changes produced were limited to the maxillary dentoalveolar component. Approximately 3.5 mm of retraction was seen along with 10 degrees of retroclination of the maxillary anterior teeth leading to a decrease in overjet and an increase in the interincisal angle in comparison to previous post-treatment records while the mandibular dentition remained stable.

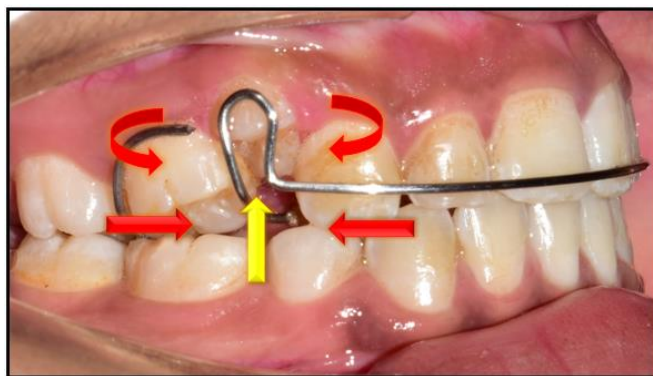


Figure 5: Involved forces

The amount of intrusion seen was surprising. Based on the cephalometric comparison of values in the vertical plane, the intrusion of premolars seen was a combination of true and relative intrusion. The mesial tipping of the maxillary molar caused the hanging of the distal cusp. This when combined with the tendency towards a hyperdivergent growth pattern could lead to a decrease in overbite from 3.5 mm to 1.1 mm (Table 1). On the other hand, the moment generated on the canine led to its distal tipping and 1.5 mm of extrusion. Both these factors constituted the “relative” part of the intrusion. To calculate the amount of true intrusion, the palatal plane was considered as a reference and the perpendicular distance was measured from the cusp tips of the premolars. The true intrusion of the premolar was noticed to be 5 mm on the left side and 6.5 mm on the right side as measured at the buccal cusp of the premolars. The lingual cusps showed lesser intrusion in comparison amounting to 4 mm on the left side and 4.5 mm on the right side.

A true intrusion of the premolars of this magnitude in a perfectly balanced bilateral fashion due to the symmetric mechanics and light continuous forces working on both sides, without causing any significant root resorption, is a daunting task for practitioners even with the help of recent advances like temporary anchorage devices (TADs), repelling magnets or skeletal anchorage. To think that this patient innocently achieved one of the most difficult tooth movements with a removable retainer is simply astonishing. It also reiterates the importance of passively designed retainers with thorough counselling of the patient about the possible sequelae of interference with the design of the retainer at home.

Even though the most commonly used retainer device for maxillary arch as reported by a survey in 2010⁶ was Hawley's there has been an increasing trend towards the use of thermoplastic retainers.⁷ This case exemplifies that the use of a thermoplastic retainer instead of Hawley's could have been beneficial with regard to the side effects caused.

III. Conclusion:

The present case scenario could also have been avoided by good communication between doctor and patient by utilizing teleorthodontics or proper follow-up visits. Unfortunately, though, the awareness about the concept of teleorthodontics is relatively new and a large number of patients remain unfamiliar with its application and benefits.

Declaration of competing interest

None.

Conflict of interest

We wish to confirm no known conflicts of interest associated with this publication.

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