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Clinical Section

Class II Combination Therapy (Distal Jet and Jasper Jumpers): a Case Report

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Abstract. *Class II combination therapy is a method that combines orthodontic and orthopedic mechanics in a single stage of treatment. Molar distalization is followed by fixed functional mechanics to reduce the dependence upon patient compliance while seeking more predictable completion of Class II correction.*

Index words: Class II, Distal Jet, Fixed Functional, Jasper Jumpers, Distalization.

Class II Combination Therapy

The concept of combination class II therapy incorporates mechanics to improve the predictability of traditional Class II treatment while requiring less patient co-operation. This technique combines orthodontic and orthopedic mechanics, performed in a single cohesive phase of fixed appliance therapy (Bowman, 1998a,b).

Class II combination therapy begins with maxillary molar distalization using the distal jet (Carano and Testa, 1996; Bowman, 1998; Huerter, 1999c; Patel, 1999) followed by Jasper Jumper fixed functional auxiliaries (Jasper and McNamara, 1995). After molars have been distalized, a Nance holding arch extending from the first molars (Bowman, 1998c) is combined with Jasper Jumpers for anchorage support of subsequent maxillary space closure (Bowman, 2000), while any potential 'orthopedic' benefits are derived.

Class II Division 2 Treatment

Class II combination therapy was recommended for a 13-year-old female who presented with a Class II division 2 malocclusion (ANB of 5 degrees and Wits of 3 mm; Figure 1). This patient exhibited a deep overbite, mild overjet, mild crowding and a midline deviation. In addition, she was congenitally missing the maxillary left second premolar and all third molars. From the cephalometric analysis, these findings were noted: a mildly protrusive maxilla (SNA 84 degrees), an acute mandibular plane angle (FMA 18 degrees), and lingually-inclined maxillary incisors (*1*-SN 92 degrees).

Non-extraction treatment was planned to involve resolution of the deep overbite, midline, and Class II relationship. The maxillary left second primary molar was to be maintained until such time that it can be prosthetically replaced with a bridge or implant.

Appliance Placement

Fixed pre-adjusted (0·022-inch slot) appliances were placed followed by the delivery of a maxillary distal jet to distalize the maxillary first permanent molars to a Class I relationship. The distal jet was fabricated using bands with buccal attachments on the maxillary first molars (i.e. convertible edgewise and headgear tubes), the right second premolar, and left second primary molar (Figure 2). The distal jet was selected as it serves not only to distalize the maxillary molars, but it can be subsequently converted to a Nance holding arch (extending from the distalized first molars to the palate).

Molar Distalization

Activation of the distal jet consisted of loosening the mesial set screw in the activation collar, pushing the collar distally to compress the super-elastic coil spring, and retightening only the mesial set screw onto the tube (Figure 3).

The initiation of levelling and alignment, using light super-elastic wires (0·016-inch), coincided with molar distalization. The maxillary arch wire was sectioned just distal to the second premolar so as not to extend into the first molar tubes and interfere with distalization. A high-pull J-hook headgear (engaged between the maxillary central and lateral incisors) was added after 5 months of distalization to reduce the potential for labial flaring of maxillary incisors that has been reported to accompany these types of mechanics (Ghosh and Nanda, 1996; Huerter, 1999; Patel, 1999; Runge *et al*., 1999) (Figure 3C). It has been recommended that additional support for distalization should be instituted (e.g. headgear or elastics) if more than 2 mm of overjet increase is noted during distalization (Gianelly, 1998).

Transition to a Fixed Functional Appliance

The distal jet was activated five times during a 6-month period and the maxillary first molars were over-corrected by 2 mm into a super Class I position as suggested by Hilgers (1998; Figure 3D). The patient did not report any discomfort or speech difficulties during distalization.

Subsequently, the distal jet was converted to a Nance

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FIG. 1 Initial records for a 13-year-old female exhibiting a Class II division 2 malocclusion. The maxillary second right premolar is rotated and the left second primary molar is retained (the second permanent premolar is congenitally absent and will need to be prosthetically replaced in the future). Note: midline deviation and mildly retrusive mandible.

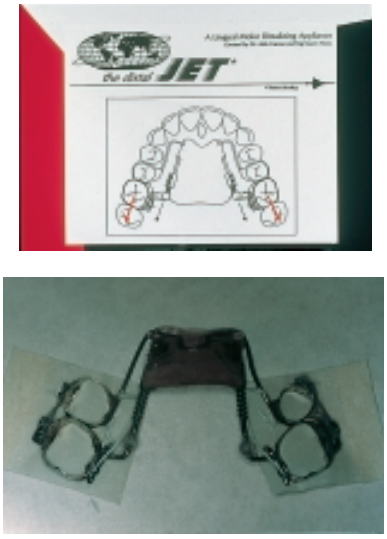
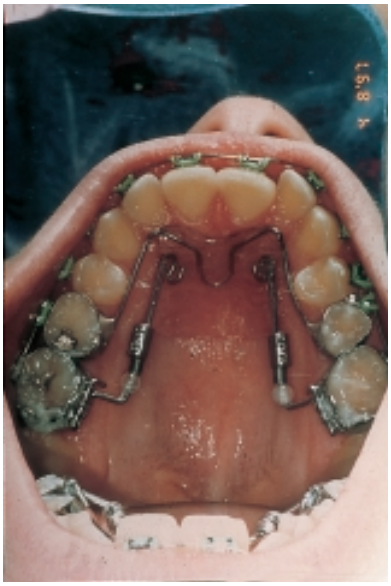


FIG. 2 Distal jet appliance prepared for delivery. Elastic chain and dental floss hold the first molar and second premolar bands together during cementation. Masking tape is used to assist in manipulating the appliance when delivering it. Glass ionomer cement is applied inside the bands and the appliance is seated as one unit,

holding arch to maintain the position of the distalized molars (Figure 3D). During this process, both set screws were locked in place (the mesial screw on the tube and distal screw on the bayonet wire) to form a solid connection from the first molars to the palatal button (Figure 3E). The super-elastic coil spring was no longer needed and was pulled away from the appliance (Bowman, 1998c). The wire extending from the palatal button to the premolar bands was sectioned at the acrylic using a bur in a high-speed handpiece and then these bands were replaced. As the Nance button is not expected to provide sufficient anchorage to support retraction of the remaining maxillary teeth, a J-hook headgear, and fixed functional appliances were added to provide additional support.

During distalization, sequentially larger arch wires had been used to level the dental arches. Upon converting the distal jet into a Nance holding arch, a mandibular 0·021 × 0·025-inch stainless steel arch wire was placed. This large dimension wire was expected to resist the labial tipping of the mandibular incisors that has been reported to accompany the use of fixed functional appliances (Weiland and Bantleon, 1995). Jasper Jumpers were installed to maintain the position of the maxillary molars during retraction mechanics (Bowman, 1998a,b, 2000; Figure 4).



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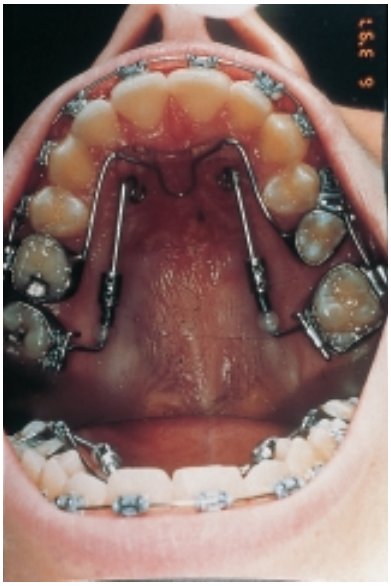

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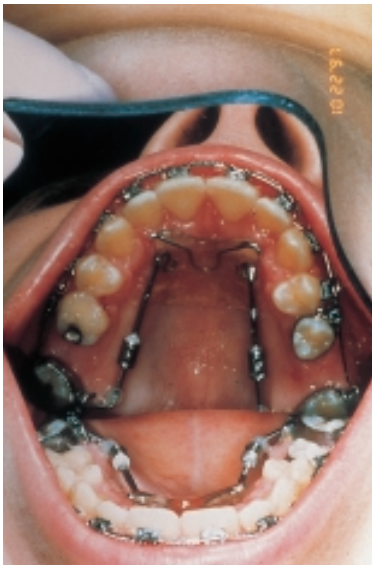

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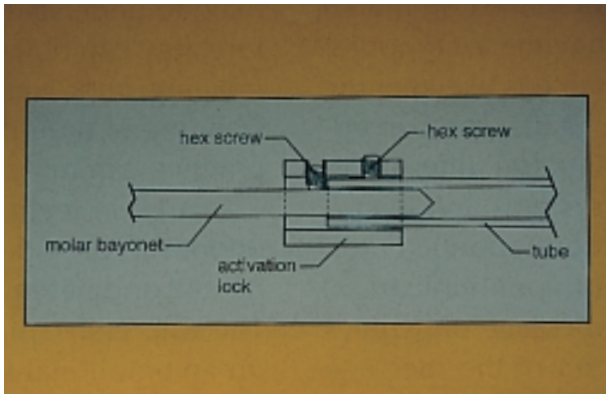
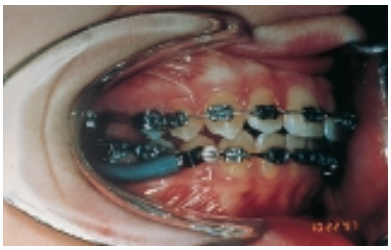


(e)

FIG. 3 Progression of distalization. (A) Initial placement and activation of the appliance. Both set screws are loosened and the activation collar is pushed distally, compressing the super-elastic coils springs. Only the mesial set screw is tightened onto the tube to maintain spring compression. (B) After 2 months of maxillary molar distalization. (C) After 5 months. (D) After 6 months (with five activations), the distal jet appliance was converted to a Nance holding arch. (Note: the maxillary first molars were over-corrected by 2 mm in anticipation of anchorage loss during retraction.) (E) Distal jet conversion: mesial set-screw in the activation collar is locked onto the tube and the distal set-screw is locked onto the bayonet wire.



(a)

(b)

(c)

FIG. 4 Continuous-arch retraction: maxillary incisors are tied together with ligature wire. Buccal segments (canine, first premolar, and second premolar) were also consolidated and retracted along a continuous arch wire. The Nance holding arch, Jasper Jumpers, and J-hook high pull headgear supported the distalized molars. (Note: overcorrected maxillary molars and Class II relationship of the canines.)

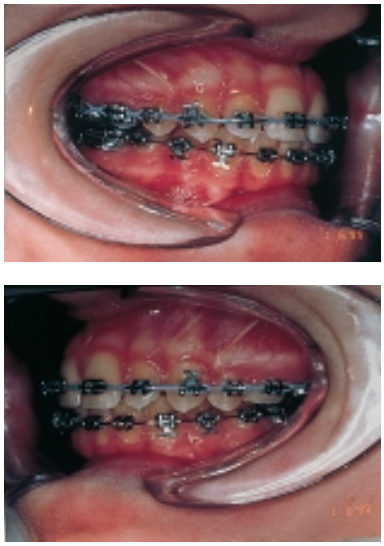


FIG. 5 Buccal segment retraction is completed. Canines are in Class I relationship. Jasper Jumpers have been removed, but the Nance holding arch is still in place. Anterior retraction, using sliding mechanics, is accomplished on a continuous archwire. Elastic chain is applied from first molar to first molar to close the remaining spaces. Intermaxillary 'triangle' elastics used to establish solid intercuspation.

Stainless steel ligature was laced from first molar to first molar to prevent spaces from opening between the mandibular teeth. Bayonet bends were placed distal to the canines in the mandibular arch wire (Blackwood, 1991). Plastic ball stops and Jaspers Jumpers (size 6) were slid onto the archwire and the wire was tied to place. The supplied steel pins were slid through the maxillary end of the Jumpers and then into the buccal headgear tubes of the maxillary first molars. About 3–4 mm of the ball-end portion of the pin was left extending out of the distal of the buccal tube. The mesial extension of the pin was bent back over the buccal tube. The patient was cautioned to support her chin when yawning and to avoid any activity that would cause her to open her mouth wide (i.e. eating large pieces of food, shouting, etc.) to prevent breakage of the Jasper Jumpers.

Retraction: Sliding Mechanics

A maxillary 0·018-inch stainless steel arch wire was placed with crimped stops adjacent to the first permanent molars. The four anterior teeth were laced together with a stainless steel ligature. Three buccal teeth (canine, first premolar, and second premolar) on each side were also tied together with

FIG. 6 Completed case after 23 months of comprehensive treatment. The maxillary left second primary molar will be retained until it must be prosthetically replaced in the future. Note: resolution of the midline, deep overbite, and improved facial balance.

laced ligature wire. Elastic chain was extended from the second premolars to the first molars to retract these buccal segments to the molars (Figure 4).

Upon completion of buccal segment retraction (Figure 5), a maxillary 0·017 × 0·025-inch stainless steel arch wire (without stops) was placed. An elastic chain was extended from right first molar to left first molar to close the remaining maxillary space. Sliding of the maxillary arch wire permitted space closure that was supported by anchorage from the headgear, Jasper Jumpers, and maxillary Nance holding arch. Eight months after distalization, the retraction was completed and the Nance button was removed, the headgear was discontinued, and second permanent molars were banded. Retraction mechanics were complicated by the breakage of two Jasper Jumpers.

Case Finishing

Stainless steel arch wires (0·018 × 0·025-inch) were used for case completion. 'Triangle' intermaxillary elastics from maxillary canine to mandibular canine and first premolar improved intercuspation. Impressions for a custom tooth positioner were taken 2 weeks prior to the removal of fixed appliances. In this instance, the positioner was used as a finishing appliance to refine the final orthodontic result. The positioner was delivered after removal of the braces and the patient was instructed to exercise into the appliance 24 hours per day for 1 week. Subsequently, Hawley retainers were fabricated and delivered with instructions to be worn 24 hours a day for 1 year, nightly for a second year, and then at least once a week indefinitely. The positioner could then be used if, in the future, some adverse tooth movement were noted or as a mouth guard for athletics. Treatment was completed in 23 months with a total of 26 treatment appointments (Figure 6).

Upon evaluation of the cephalometric tracings (Figures 7 and 8), normal facial development continued during treatment with mild skeletal improvement (ANB improved from 5 to 4 degrees and Wits from 3 to 2 mm) and favourable facial aesthetics, without a change in the mandibular plane angle. The maxillary incisor angulation improved (*1*-SN 93–103 degrees), but adverse labial tipping of the mandibular incisors was noted (IMPA 100–108 degrees). Perhaps the use of lingual crown torque in the appliance prescription for the mandibular anteriors (instead of a straightwire prescription) should be considered to reduce this negative response from fixed functionals in future cases.

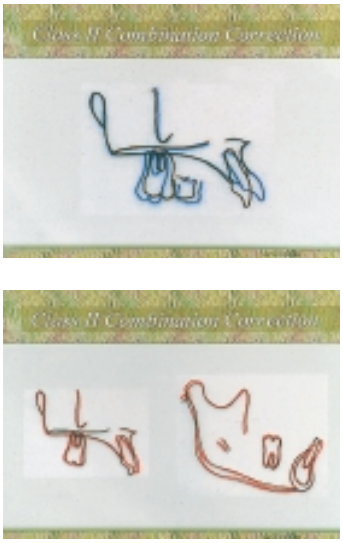


FIG. 8 (A) Initial and post-distalization maxillary superimposition. Note: significant labial tipping of incisors during distalization and leveling with distal jet and fixed appliances. Molar distalization with minimal tipping was achieved in 6 months. (B) Initial and final maxillary superimposition. Improved incisor inclination achieved. (C) Initial and final mandibular superimposition. Note: favourable mandibular growth and adverse tipping of the mandibular incisor from the use of Jasper Jumpers.

FIG. 7 Cephalometric tracings. (A) Initial and post-distalization. (B) Initial and final.

FIG. 9 (A) Concepts of Class II combination therapy. (B) Appliances in the practice of Class II Combination Therapy.

Conclusions

Class II combination therapy is a comprehensive single-stage technique designed to reduce dependency upon unpredictable patient compliance and to complete treatment in a timely and consistent manner (Figure 9A,B). General contra-indications to this type of mechanics include cases that feature one or more of the following: significant crowding, bimaxillary protrusion, obtuse mandibular angles, or open bites.

Appendix

Archwire Sequence

Max. and Min. 0·016-inch super-elastic.
Min. 0·018 × 0·025-inch stainless steel.
Max. 0·018-inch stainless steel.
Min. 0·021 × 0·025-inch stainless steel.
Max. 0·0175 × 0·025-inch stainless steel for retraction.
Max. and Min. 0·018-inch super-elastic.
Max. and Min. 0·018 × 0·025-inch stainless steel.

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