Cantilevers for Cl II Corrections

Introduction:

Cantilevers offer orthodontists the quintessential biomechanical instruments for solving many problems of malocclusions. They give clinicians statically determinate, simple and efficient mechanisms that deliver forces easily measured and managed during their use and deactivation.

Textbooks describe a cantilever as a beam secured at one, end,which carries any load to that anchored end and produces a moment and force. The free end of the beam has a one-point contact and produces only a force.

Orthodontists can consider cantilevers as a Class I lever where the effort is applied via a single point of contact and the resistance within a tube or bracket, which provides two points of contact. Orthodontic cantilevers can involve a reactive-anchor within a bracket or tube or within the acrylic of a removable or fixed appliance while the active end of the cantilever touches a tooth or a wire at only one point[1].

Class II Cantilever Correctors

Two well-known Class II correctors that act like cantilevers even though their creators have never referred to them as such are:

- Pendulum Appliance developed Dr. Jim Hilgers[2];
- Carriére® Motion™ Appliance originated by Dr. Luis Carriére[3].

The Pendulum Appliance (Figure 1) fixates the wire within the acrylic of the mechanism and the active part of the cantilever wire makes a one point contact within the lingual sheath of the molar

The Carriére® Motion™ (Figure 2), on the other hand, has the fixed, reactive part of the cantilever beam attached to the canine or premolar, while the active part has a one point contact via the rotational ball-and-socket that works against the molar. The distal force for this appliance depends upon a Class II elastic attached to the more anterior tooth of the cantilever.

Figure 1: Pendulum Appliance preactivated before the .036 TMA cantilever wire is inserted into the .036 doubled lingual sheath.

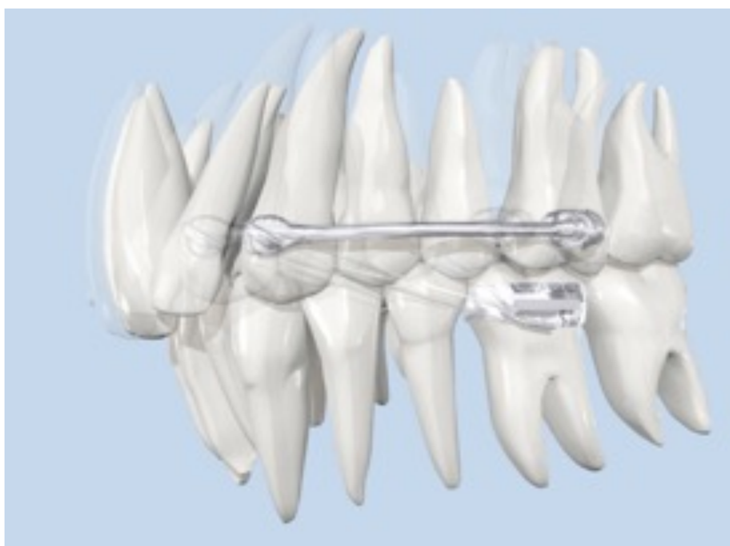

Figure 2: Carriére® Motion™ Appliance illustrates the fixed-anchored part of the appliance bonded to the canine and the one-point contact via the ball-and-socket arrangement against the molar.

For the purposes of this article, cantilevers have a secure end fixed in a bracket or tube and the free end contacting a wire, tooth or elastic. Nanda[4] has illustrated a way of using the .032 hinge-cap lingual tube developed by Burstone[5,6] to fabricate a cantilever for correcting Class II malocclusions (Figures 3). The light elastic potentiates the cantilever by providing a distal force to the molar along with a strong moment that tips the molar distally. The resultant force from the cantilever and the elastic is downward and backwards (Figure 4).

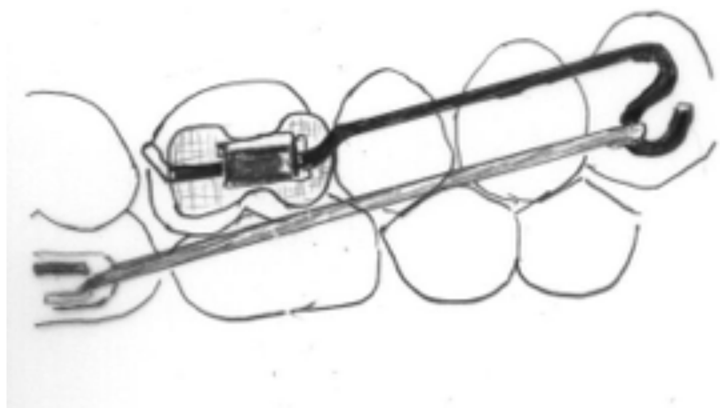

Figure 3: A schematic of a .032 x .032 TMA attached to the molar through a bonded hinge-cap lingual tube with the free end of the cantilever touching the Class II elastic.

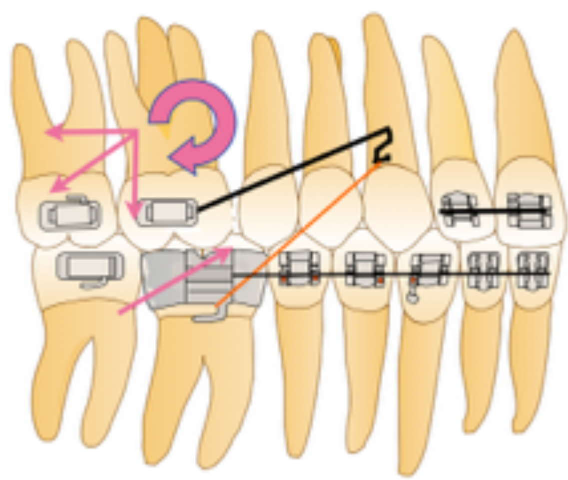

Figure 4: The force system from the appliance shown in Figure 3.

Another way of effecting similar movements on the molar is with a two piece cantilever that uses an anterior sectional arch in the incisor brackets. The cantilever is secured in the molar tube and has a one-point contact to the anterior sectional wire. The disadvantage of this cantilever design lies in the intrusion of the maxillary incisors, which is seldom needed or wanted (Figure 5). Clinicians can neutralize such intrusion by applying Class II elastics to the anterior sectional wire.

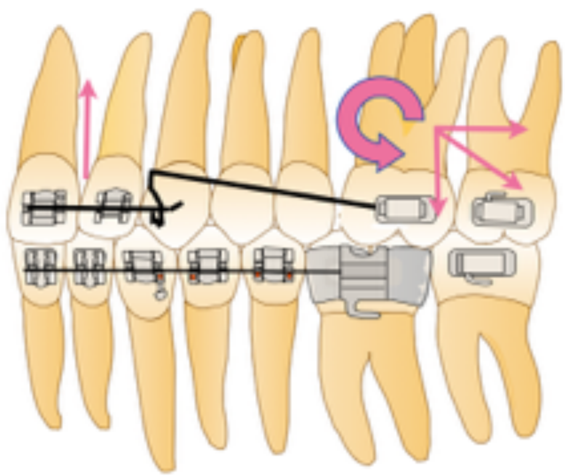

Figure 5: A schematic for a cantilever from the molar attached to an anterior sectional wire. Note the intrusion of the maxillary incisors.

A New Design for A Class II Correction Cantilever

A new simplified Class II cantilever is displayed in this article along with a clinical result of the design. It requires minimal instrumentation that is ordinarily part of the orthodontic clinician's armamentarium.

A long stainless steel (8mm) crimpable hook is bent 90° twice to give a horizontal span to which a sectional arch wire hook can attach (Figure 6 a & b). The bent tube is then bonded to the canine with light-cured orthodontic composite (Figure 7). A slightly long sectional arch wire (.016 x .022 or .014 x .018) is fabricated with a large omega loop that will abut the molar tube and a hook that will provide a one-point contact against the bent crimpable hook bonded to the canine. The sectional arch wire is tipped upward, and when the omega loop touches the molar tube will lie in front of the bonded canine hook by about 1-2mm. When the sectional arch wire is brought occlusally and attached to the crimpable hook, it will slightly compress the omega loop, which will create a distal force

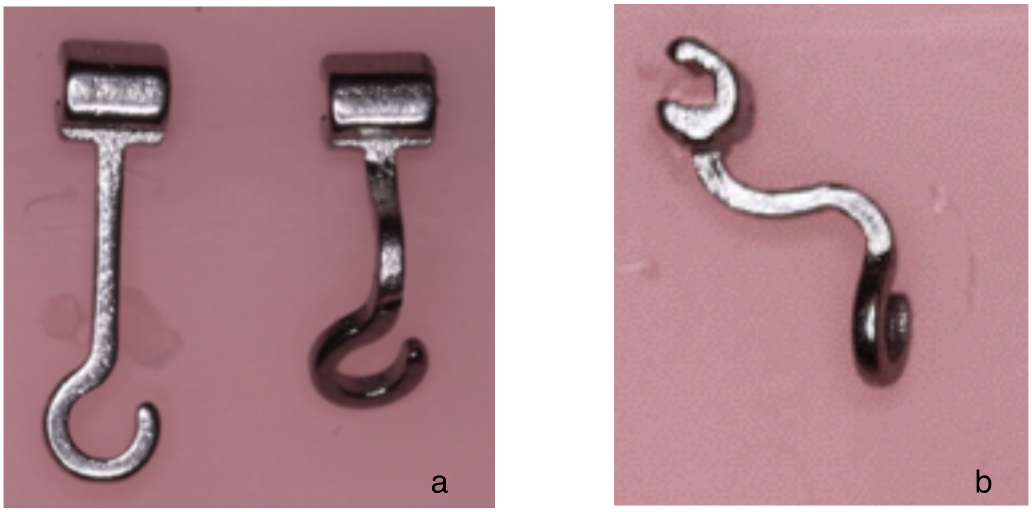

Figure 6 a & b: Unbent 8mm crimpable tube & bent tube from two views.

Figure 7: Bent crimpable tube bonded to the maxillary canine.

on the molar along with a strong distal moment and, simultaneously, will produce a forward and intrusive force on the canine (Figure 8). By adding Class II elastics or springs, clinicians can neutralize the intrusive and anterior pressures on the canine (Figure 9).

The following photos illustrate the clinical effect of this cantilever design (Figures 10 - 13).

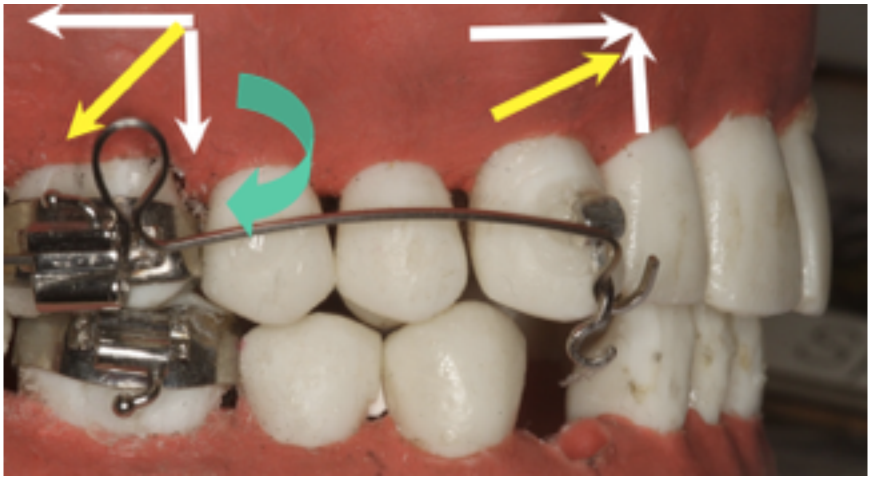

Figure 8: Note the compression of the omega loop and the slight bowing of the cantilever as it responds to the length of the wire.

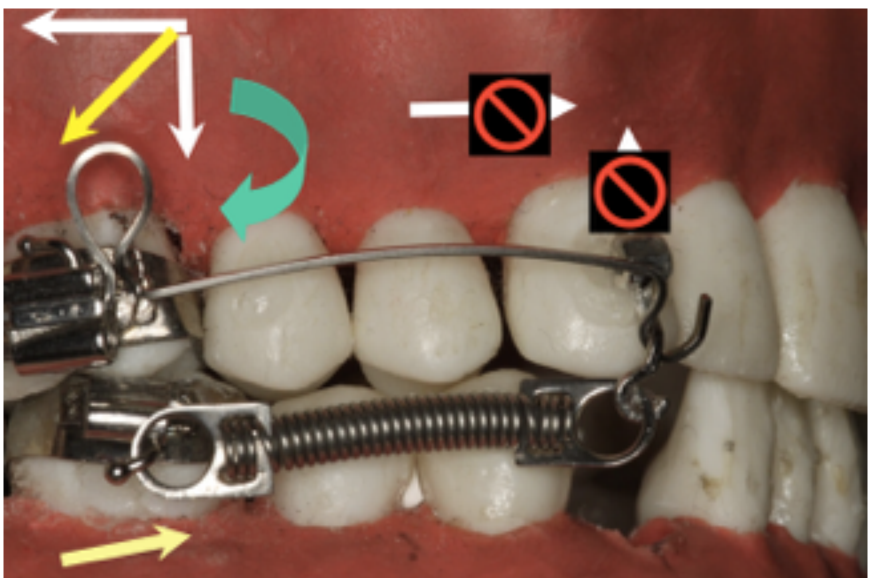

Figure 9: Adding a Class II force with elastics or springs can negate the anterior and intrusive forces on the canine. The hooks on the molar & canine need closure to maintain the spring in place.

Figure 10: Initial Cl II subdivision.

Figure 11: Occlusion after 4 mos. of cantilever therapy. Note the tipped molars, maxillary space created and eruption of premolars into Cl I positions.

Figure 12: Occlusion after complete banding and bonding.

Figure 13: Photos of cantilever treatment therapy.

Conclusion

Class II malocclusions offer orthodontic clinicians some of their most formidable challenges, which accounts for the large number of complicated and expensive mechanisms for their corrections, e.g., Herbst, MPAs, Forsus, MARA, Distal Jet, Pendulum, Carriére® Motion™, etc.

The Class II cantilever corrector featured in this article provides the profession with a simple, effective and efficient technique of correcting Class II malocclusions based on sound biomechanical principles without the harmful side effects of the aforementioned appliances, The Herbst, MPA, MARA and Carriére Distalizer and other fixed functionals typically displace the mandibular incisors facially, while the Pendulum, Distal Jet and other similar appliances displace the maxillary incisors facially.

The cantilever corrector requires a minimum of instrumentation, time and skill to implement and allows clinicians to solve the most difficult feature of Class II malocclusions at treatment initiation when patients have the most enthusiasm and interest in their therapies. Once the Class II has changed into a Class I, the treatment completion becomes a predictable and quickly resolved matter.

Bibliography

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