



Duncan W. Higgins
DDS, MSD, FRCD(C)

Duncan practices in North Delta, BC, a suburb of Vancouver. He went to dental school at the University of Alberta and studied orthodontics at Indiana University. In 1981 he joined the practice of Dr. Michael Wainwright who became his mentor and taught Duncan indirect bonding. Duncan went on to develop a light cure indirect bonding technique which was published in *Seminars in Orthodontics*. He holds patents on the Crossbow™ Class II Corrector. The University of Alberta has carried out research on the Crossbow which has been accepted for publication in the *AJODO*. He lectures on Crossbow, Indirect Bonding, and CAAPP in Canada and the US. More information is available at www.crossboworthodontic.com.

CAAPP

Combination Active Anteriors & Passive Posteriors

Now With .018 Carriere Bracket System

The past decade has seen an explosion in the popularity of passive self-ligating brackets. Working in a light force, low friction environment certainly has its advantages, but do we have the same incisor control that we did with conventional ligated twin brackets?

Some issues to consider are:

- 1. Passive self-ligating bracket systems have not been shown to be more clinically effective than conventional ligated brackets during tooth alignment^{1,2,3,4}. Improvements in archwire technology have given us the ability to completely align incisors with very light, round nickel titanium archwires in conventional ligated brackets. Passive self-ligating brackets require the progression from light round through rectangular nickel titanium archwires in order to completely align incisors.**
- 2. Young patients continue to ask for colored elastic ligatures on their incisor brackets as a means of personal expression.**
- 3. There is still a demand for ceramic brackets and Teflon coated ligatures on upper anteriors.**
- 4. Torque control of upper incisors with passive self-ligating brackets is less precise compared to conventional ligated twins.**

The CAAPP Bracket System

We have been using a bracket system for the past ten years which combines ligated twins on the incisors and passive self-ligating brackets on the canines and bicuspids. It is a Combination of Active Anteriors and Passive Posteriors or simply, CAAPP. This gives us early first order incisor control with the lightest archwire ligated to the base of the bracket slot. It also gives us reduced binding friction for canine retraction, incisor advancement, and posterior space closure offered by convertible tubes on the canines and bicuspids. Each arch is treated as two posterior segments and an incisor segment. The posterior segments are essentially long buccal tubes.

The trick is the same as it always has been — fast alignment of the incisors with the lightest force possible and consolidation of the anterior spaces so we can fill the incisor slots with a rectangular archwire for early third order control and full expression of the bracket prescription. We tried different passive, as well as active, self-ligating bracket systems until we discovered the Carriere bracket. The simple design of the locking mechanism must be the reason that we have experienced fewer problems with this bracket than any other self-ligating bracket that we have tried.

The integrated hooks on the canines and bicuspids make it easy for the patients to place vertical elastics. Unlike some other passive systems, it is available in a .018" slot. .018" has the advantage of filling the slot earlier for third order control with lighter forces. We rarely use anything larger than .016 x .025" and we almost always finish in a .016 x .022" beta titanium (CNA=Cerum Ortho Organizer equivalent wire) which allows adjustments with light activations. *Black-Ti™ dimpled archwires are round nickel titanium wires with a hard black oxide surface which reduces sliding friction. We have found these to be very efficient when used with light coil springs to open space for blocked out teeth. Conventional twin brackets are available in many prescriptions and we still have the option of using high torque brackets on the upper incisors in Class II division 2 or extraction cases.

* Black-Ti™ is available through Cerum Ortho Organizers

CAAPP is a bracket system with the following goals.

1. Creating a “Long Buccal Tube” for low friction arch wire feeding with Carriere passive self-ligating brackets on the canines and bicuspid, and tubes on the molars.
2. Getting the most movement of the incisors with the least force with traditional twin brackets and a light round niti arch wire ligated to the base of the slot.
3. Patient comfort.
4. Respecting patient’s request for coloured ligatures on their incisors.
5. Placement of rectangular archwires as soon as possible for early torque control of upper incisors.

Finishing Alignment with the Lightest Archwire

Engaging a light round niti archwire into crowded incisors is analogous to activating a spring. In order for the arch wire to work out and the incisors to align efficiently, the arch wire must be able to feed through the canine and bicuspid passive self-ligating brackets and molar tubes with as little friction or resistance to sliding as possible. Ligated canines and bicuspid were major roadblocks to free sliding before passive self-ligating brackets. In order to get maximum activation with the lightest archwire it must be ligated to the base of the slots in the incisor brackets. If passive self-ligating brackets are used on the incisors and the archwire is not ligated to the base of the slots, the “spring” is not completely activated due to the play between the initial light round archwire and the slot. There is ten degrees of play between a .014” archwire and a .0275” passive bracket slot. Some passive bracket slots will accept two, .014” archwires. With CAAPP we generally completely align incisors with a .012” or .014” niti archwire which deliver approximately 50 or 75 grams of force per tooth, respectively. If passive, self-ligating brackets are used to align incisors, then the slot must be filled with a .014 x .025” niti arch wire which can exert over 300 grams. This magnitude of force is more commonly used to move molars, not incisors. Harris⁵ found that the amount of root resorption is proportional to the force.

CAAPP — Incisor Torque Control

In comparison to conventional brackets with similar torque prescriptions, self-ligated brackets tend to need more torque incorporated into the archwire, due to

the play between the archwire, slot walls, and ligation mechanism. Badawi⁶ found wide variations in torque expression and high degrees of bracket archwire slop in passive self-ligating bracket systems. He showed that active stainless steel self-ligating brackets demonstrated an engagement angle of approximately 7.5 degrees, whereas the passive stainless steel self-ligating brackets demonstrated an engagement angle of approximately 15 degrees with .019 x .025” stainless steel wire in a .022” slot. He also showed that in order to achieve clinically effective torque it required 15 degrees of extra torsion in the archwire with active self-ligating brackets, and 22.5 degrees of extra torsion for passive self-ligating brackets with .019 x .025” stainless steel wire in a .022” bracket slot.

The goal of CAAPP is maximum efficiency and rapid tooth movement with the lightest forces.

This translates into total activation on incisors with the lightest archwire but also free sliding of the canines, bicuspid, and molars with a full size rectangular archwire to take full advantage of the bracket prescription. The incisors are aligned and incisor space consolidated as quickly as possible with round archwires so that rectangular archwires can be placed to control incisor torque. We are seeing many cases with complete alignment of crowded incisors in two months with a .012” niti archwire. (See Cases 1 and 2 below.). We are also seeing space opening with a niti coil spring faster than we did with ligated canines and bicuspid (See Case 3 below.). Are we approaching the biological limits to low force and speed of tooth movement?

References

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Anterior Control with Lighter Forces

CASE 1



018 CAAPP — Carriere initial bracket placement



2 months progress with .012 niti,
day of .018 niti placement

CASE 2



018 CAAPP — Carriere initial bracket placement



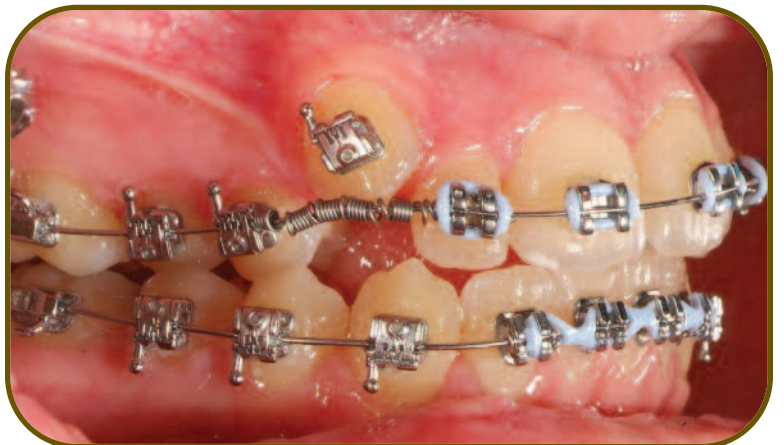
2 months progress with .012 niti,
day of .014x.025 niti placement

Article and Photos courtesy of Dr. Duncan Higgins
Credit to Sandra Ipsen and Wendy Schock for photography

CASE 3



Initial, note that first bicuspid are end on Class II



.018 CAAPP Carriere: 2 month progress with .014 niti upper for 1 month followed by .016 niti upper and open coil spring.



*5 months progress, note that first bicuspid are Class I.
Overjet did not increase as both upper and lower incisors proclined.*