

# The Evolution of the Bio-Compatible Bracket

by

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THE SCIENCE OF INNOVATION



THE ART OF PATIENT CARE

The following is an excerpt from

## **The Ortho Evolution**

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**This textbook is available for purchase from GAC International, Inc.**



Figure 7



Figure 8

First arch wire, .018 x .018 BioForce® with IonGuard™, AccuArch® form. Note build-up of Esthetx Flowable composite to vertically unload TMJs, redirect growth and disclude teeth to permit unencumbered freedom of motion of TMJs and teeth

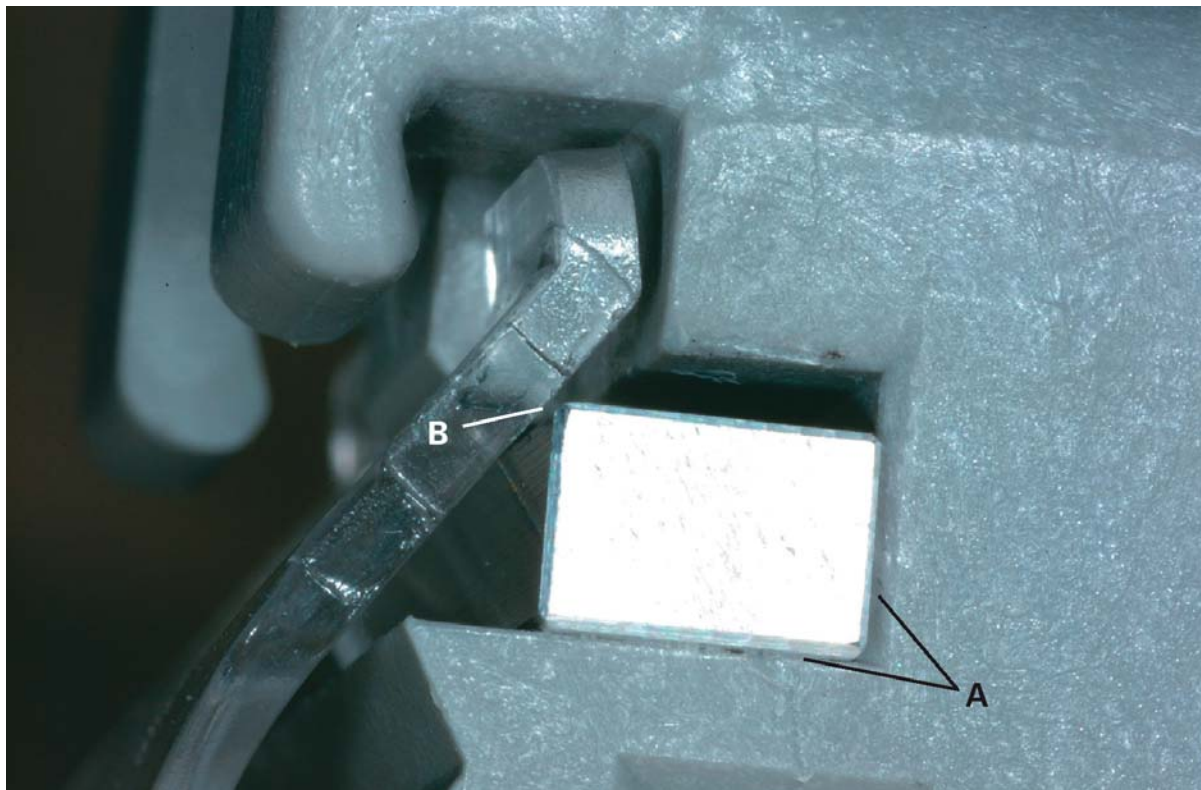


Figure 9 Close up view of bracket slot with wire inserted. Note: Torque is controlled at Point A and B, but not by the bracket slot. This makes it critical that the archwire must fill the slot vertically for torque to occur.



Figure 1



Figure 4



Figure 2



Figure 5



Figure 3



Figure 6

# The Evolution of the Bio-Compatible Bracket: 2003 & Beyond

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I have successfully used the Alpern Bio-Compatible bracket system for more than twenty years, but scientifically I knew this too must evolve.

The MicroArch<sup>®</sup>, version of the Alpern Bio-Compatible system and its many features are an evolution from many years of clinical experience. The one limitation of this bracket system was it required stainless steel ligatures. Steel ligatures were used on me as an orthodontic patient more than 40 years ago. They have not changed since that time. They represent a compromise to efficient treatment necessitated by the limitation of bracket/wire dynamics in early bracket design and production.

Stainless steel ligatures are operator specific. In order for stainless steel ligatures to function properly, they must completely secure the arch wire in the bracket slot. They must fit tightly to seat the wire in the base of the slot. The pig tail must be tightly wound, long enough only to retain strength, and tucked in a direction so as to not harm the patient's cheeks, lip, or gingiva.

The obvious flaws are: 1) operator specific, 2) they tend to stretch and loosen, 3) they are constantly an irritation to the patient, 4) they become a food trap, 5) they can cause the wire to bind, producing unnecessary friction 6) they make orthodontic

treatment very labor intensive, and arch wire changes require extensive amounts of time.

In the last ten years I drew multiple designs for a ligature-free bracket. Most of my designs involved the principle of a pocket with a nickel titanium door that slid vertically, opening and closing the bracket slot. Unfortunately, every engineer I took the design to could not create such a bracket.

When GAC first introduced a ligature-free bracket, I was asked to try the bracket system. I could not make this system work with my mechanics. My orthodontic treatment is principled on large inter-bracket distances that permit nickel titanium wires to flex and not bind. I also had some difficulty opening and closing the springs. I had tried a number of ligature-free brackets in the past and no matter who made them, they all seemed to fail when I inserted a large rectangular finishing wire.

In late 2002, GAC introduced the In-Ovation-R<sup>®</sup> bracket. Many of the design improvements were hopefully the result of my complaints about too little inter-bracket distance and difficulty in operation. An innovation in opening the clip is the result of the efforts of my good friend, Dr. Perry Opin of Milford, Connecticut.

We needed a very small bracket or a bracket with large inter-bracket distances. We needed a locking mechanism that was passive when we wanted it to be, and active when we needed action or force. We asked for a locking mechanism that was easy, yet solid; one that would remain closed when required. We needed this bracket with all the available hooks of the Bio-Compatible system as well as the torques, tips, and rotation or non-rotation all described previously.

The In-Ovation-R bracket is rhomboid shaped. It should be placed parallel with the long axis of the tooth and the occlusal of the base parallel to the incisal edge. The brackets are bonded with the clip in the open position, and thus the clinician can place the bracket slot at the center of the tooth.

The Opin-R clip has the entryway to the slot blocker canted so that an explorer can be gently pulled over the facial surface of the bracket, and it will catch and open the slot. It is designed so that if the "whale's tail" is not accessible, either due to gingival inflammation or calculus or other debris, it will allow easy opening. The clip is made from "Spron" which is an Elgiloy type wire. Thus the clip has spring in its action.

The center of the bracket is recessed so that when using light wires such as .014 or .016, the clip does not affect the wire. In this state, some would describe the clip as "passive." However, when a large enough square or rectangular wire is used, the clip is "active."

Because In-Ovation-R brackets are manufactured using a MIM process, the brackets are 'Compound Contoured.' They tend to fit each tooth correctly. Better bracket fit to the tooth relates to better ease of positioning the bracket and fewer bond failures. The brackets are also manufactured using a process that has centered base torque.

The arch wire slot is chamfered which permits easier insertion. The patented 3 Ply SuperMesh® Base is in reality 80 mesh over 150 mesh which permits enhanced mechanical bonding. This mesh is sandblasted and Palmer notated on the base.

The mechanical etching is only on the base, not on the bracket. Finally, the base is laser welded to the bracket.

All these features have produced a bracket that is truly exciting to use. Arch wire insertion, removals, and changes occur in a few minutes. This is the only system I would ever consider changing an arch wire in the last portion of the day, when every chair is filled with observation/progress appointments after school hours. Yet, this task is feasible in only minutes.

**You must fill the slot vertically to gain full, accurate activation.**

When I first began using ligature-free brackets, my initial wire, was a .016 x .022 BioForce® arch wire with IonGuard™. I soon began to see inconsistent torque results. What I had prescribed into the bracket slot was not what was occurring in the mouth. I had been accustomed to seeing my prescribed torque with smaller diameter wires in my standard brackets, but with the ligature-free systems, I saw a different result, especially in the maxillary and mandibular incisors. Careful examination revealed that when a .016 x .022 wire was inserted in a .018 slot, the wire was activated by the gingival surfaces of the vertical and horizontal portion of the bracket slot on one side of the wire. While on the opposite side of the wire, instead of the incisal or occlusal vertical and horizontal surfaces of the bracket slot touching the wire, **only the clip touched the wire.** This changed the torque, often changing the prescribed torque. **This appears to be true of all ligature-less bracket systems.** If you really want to upset a clinician, have the clinician place any appliance with a prescribed movement of teeth inserted, and then four to eight weeks later present the clinician with a result other than expected. The answer, when using ligature-less brackets is to make sure your arch wire **fills the bracket slot vertically.** (See Figure 9)

Understanding the full size wire dynamic addresses my need to express the full torque value from my bracket. To address this situation, we simply insert any wire that fills the vertical slot first. **The horizontal portion can be filled progressively, but the vertical portion must be filled from the beginning or as close the beginning as possible.**

### **ALPERN In-Ovation-R® ARCH WIRE SELECTIONS:**

First Wire: .018 x .018 BioForce with IonGuard.

Alternative first wire: .016 x .016 BioForce with IonGuard, where significant irregularity is present.

Second Wire: .018 x .018 Resolve (Beta Titanium) with Ion Guard.

Alternative second wire: .018 x .025 Resolve with IonGuard, where required.

Essentially, this is the only change in the Bio-Compatible System. I upgraded my brackets to ligature-less, maintained the same prescription for torque, tip and rotation and added the AccuPosts.

This has reduced chair time for wire changes. Orthodontics, in our practice has become much less labor intensive. Patients are much more comfortable. Patients also claim it is much easier to clean their teeth when no stainless steel ligature pig tails are in the way. Patients claim this system is less irritating to lips and cheeks from the very beginning. Our dental hygienist has found improved oral hygiene and periodontal tissues appear much more healthy. Since patients are much happier, this has a positive impact on marketing our practice.

All existing mechanics appear the same. For example, where there is crowding, push coils quickly open space. This is exactly the same technique I would have used with the previous system.

A current controversy appears to exist regarding the importance of “friction.” The following is the author’s opinion. I am not concerned with the concept of

“friction” because it has never been a factor in my orthodontics. The reader will recall in a five year study, I treated more than 65% of my patients in two years or less. If I had a friction problem, I would not have been able to accomplish such short treatment time especially with very difficult cases.

My primary concern is not friction, but **control**. My approach is I want as much three dimensional control as possible from day one of treatment. If you disregard the terms “active and passive” and focus on control, the cloudy issues appear crystal clear.

I use passive wires to hold or prevent the movement of teeth. Or, to free-up the teeth to permit settling to occur.

I prefer all other wires and bracket systems to give me as much control as possible from as close to the beginning of treatment as possible. My initial wire in an .018 slot Alpern In-Ovation-R® ligature-less bracket system is primarily a .018 x .018 Bio-Force wire with IonGuard in the AccuArch® design. This wire is chilled prior to insertion and individually chilled (as described previously) with frozen Polar Bears or chilled cotton swabs. This permits complete insertion of the arch wire into the bracket slot and complete closure of the door or closing clip. Is this possible in every bracket slot; of course not. Where complete closure is not possible, push coils springs, or partial ligation is used or, in very irregular cases, a .016 x .016 Bio-Force wire is used for two to three months. Usually, by the second or third visit, all brackets are in complete ligation.

The advantage to this system is I strive for complete three dimensional (tip, torque and in/out) movements as soon as possible. Naturally, there are situations where I must move a tooth which was far out of position much closer to the arch wire before I institute three dimensional control. Here, I use other systems (other than the bracket slot) until it is appropriate to use the bracket slot.

It is my opinion, the In-Ovation-R® bracket system will be part of the future of the OrthoEvolution.

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