Bringing Orthodontics Into The 21st Century

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The Current State of the Art in Orthodontics

In the early 1970s, Andrew[1] introduced the Straight Wire Appliance that permitted1st, 2nd, and 3rd order movements for teeth without wire bends. The decade of the 70s proved fertile in yet another significant way with the introduction of nickel titanium wires.[2-4] By the 1990s, development of new titanium wires (that responded to thermal changes) made the ligation of severe rotations easier, and the wires worked longer without requiring change[5-7].Yet, for all of the sophistication these new materials have brought to orthodontics, the mechano-therapy has not changed appreciably nor has the treatment time for patients diminished. Invasive techniques requiring heavy arch wire forces, multiple extractions, and palatal expanders, etc. remain favorite therapies for many orthodontists. These appliances, however, fail to mitigate the damaging effects of classical, routine orthodontic forces.

A New Approach to Tooth Movement & Facial Balance

For the past ten years, Dr. Dwight Damon has pursued the idea of "physiologically determined" tooth positioning using very light forces. Recent advances in CT technology seem to confirm Damon's belief that when "biologically sensible forces" are applied to the teeth, the alveolar bone can and does remodel itself, and a new physiological balance can be achieved. Patients treated with light forces, in passive tubes (with large arch forms that have small wire-to-lumen ratios,) demonstrate movement of teeth with little tipping in all planes of space. Supporting alveolar bone also follows the teeth (Figure 1).[8]

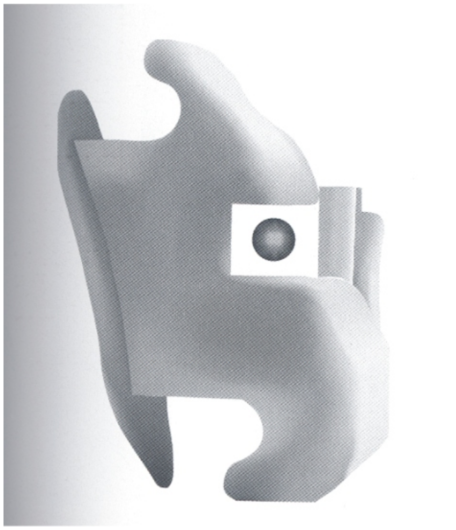


Figure 1: The Damon tube: leveling, alignment and arch adaptation depend upon a small wire-to-lumen ratio in a low friction environment.

A review of Retian's[9-12] and Rygh's [13,14] work regarding the effect of conventional forces on the periodontium and alveolar bone further convinced Damon that orthodontists needed to apply light forces to achieve less damaging and more natural physiological movements of teeth – particularly when trying to expand the arch form.

Development of the Damon Appliance

Several features of conventional orthodontic therapy have prevented the application of light forces, e.g., dependence on larger wires, a binding ligation system, a high wire-to-lumen ratio and heavy reliance on extraction therapies. The reduction of forces thus requires an entirely different system of brackets combined with a new system of force application. This requires nothing less than a quantum or qualitative change in orthodontic diagnosis, treatment planning and therapy.

In the cases I have treated with the Damon philosophy my patients have noted more comfortable and faster tooth movement. By taking patient records at frequent intervals and analyzing these cases I can now say that by minimizing the interruption of blood flow during tooth movement, with low-force wires, I have shortened the treatment time, lessened patient discomfort and brought the treatment time of adults within the range of children.

Begin with the Face

The Damon system begins with the face. Instead of relying only on points and lines on osseous tissues in cephalometric tracings, Dr. Damon suggests that we should also consider and treatment plan for the profile, arch width and facial support of our patients. With the Damon system we try to match our treatment mechanics with the natural low-force systems of the body.

Rather than a typical bracket which relies on conventional ligation, Damon felt a bracket that functioned as a tube with a static facial wall would obviate ligation all together and allow the passive appliance needed to achieve physiological forces. He developed a bracket with a sliding facial wall that allows simple insertion, but closes to encapsulate the arch wire without tightly binding it.

Self –ligating Bracket

The first generation of the Damon self-ligating bracket was introduced in 1995 (Figure 2). Along with this new bracket concept, Damon fundamentally changed the types of arch wires and the sequence in which clinicians use them. His experience has shown that with many patients he can often eliminate retraction of molars, extractions (excluding those needed to reduce bimaxillary protrusions) and rapid palatal expansion. He offers compelling clinical evidence of doing such treatment with consistency.[15]

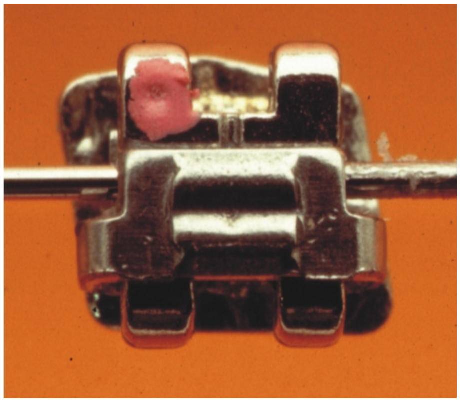


Fig 2a : Damon version 1 (Damon SL)

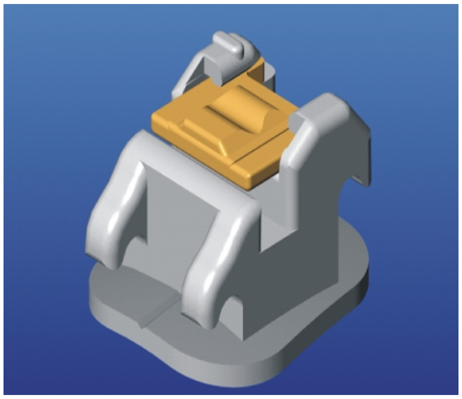


Figure 2b: Damon 2 bracket in closed position

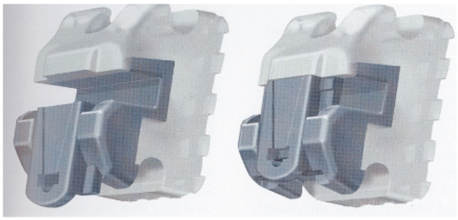


Figure 2c: Damon 3 bracket opened and closed

Archwires

The archwires Dr. Damon advocates as the initial wires are quite light in force (round .013 Copper NiTi™, Ormco Corporation, Orange, CA) and with a wider arch form in comparison to those typically used by orthodontists. Damon persists in using these wires for longer intervals in order to fully exploit their developmental potential. This allows longer time periods between appointments, less discomfort and fewer disruptions in patients' lives.

Advantages & Disadvantages of the Damon Appliance

No system of orthodontic therapy offers unalloyed blessings, and the Damon system has some distractions; e.g. the bracket cost and its relatively large size. Nevertheless, its advantages more than outweigh these minor objections and offer the following substantial rewards for doctors and patients:

- Shorter treatment time;

- Fewer appointments;
- Fewer extractions;
- The elimination of RPE's in most cases, and simplified mechanics in nearly all cases;
- Less reliance on patient compliance;
- A shorter learning curve for auxiliary personnel;
- A focus on tooth alignment and facial balance;
- Increased productivity and profitability.

Is this a better system?

The most logical questions readers could propose would be why has Damon shown successfully sustained development of arches whereas Angle and others did not? The quantity of expansion probably differs little, but the quality of expansion offers a quantum change. Mollenhauer[16,17] has suggested as much with his appeal for light forces. Even though Angle used a ribbon arch (which suggests a thin, delicate wire) the actual size of the wire had the dimension of .036 x .022 inches. Ligating to this wire would overwhelm the periodontium and prevent the development of a supporting dentoalveolus.

Typical edgewise arch wires also generate far more force than that compatible with physiological dentoalvelolar development. Rather than forming new bone, the supporting dentoalveolus simply bends and upon completion of treatment quickly returns. Astute clinicians often see this with molar retraction from headgear use and overtreat such cases in order to compensate for this regressive bone bending. Other researchers offer compelling evidence of bone bending as a feature of orthodopedic appliance therapy, [18]and they suggest the need of subsequent dentoalveolar development and modified posterior occlusion to maintain orthopedic corrections.[19]

Applying Physiological Forces

The most important caveat Damon offers clinicians is not to use their ordinary mechanics with this system, and I could not agree more. When I first began to use the system, I continued to use the regular sequence of arch wires and saw little advantage to these new, more expensive brackets. Nevertheless, as I began to use them according to Dr. Damon's advice, I started seeing phenomenonal changes. The following patients illustrate typical responses to the biomechanics offered by the Damon System.

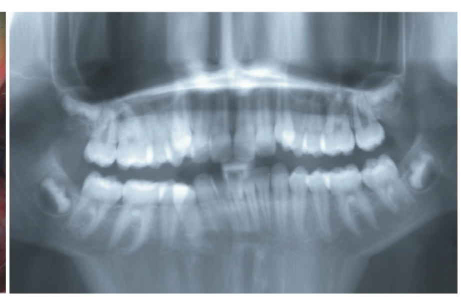
Patient Case Report: Pre Treatment


Before Ceph


Before Frontal

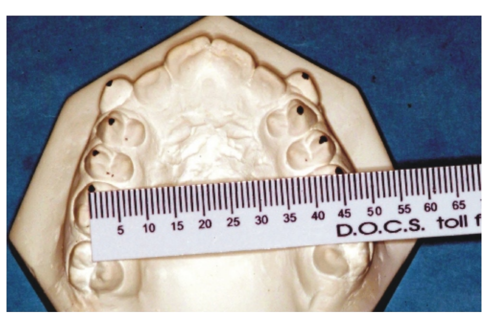

Before Left Buccal


Before Lower


Before Opg


Before Right Buccal


Before Smile



Before Upper Model

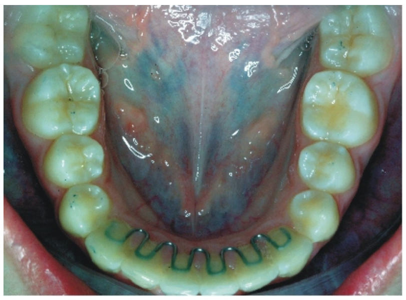

Before Upper

Post Treatment

After Ceph

After Frontal

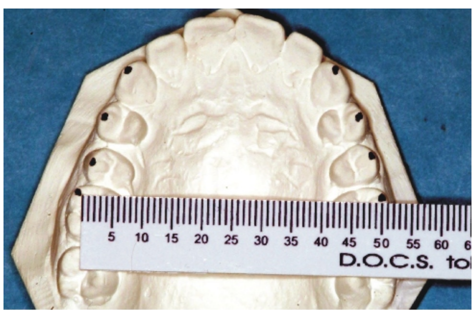
After Left Buccal



After Lower

After Right Buccal

After Smile



After Upper Model

After Upper

Afteropg

Summary

Our profession is witnessing an interest in qualitatively different biomechanics that offer the possibility of eliminating, or at least significantly reducing the use of headgears, rapid palatal expanders and serial extractions. Nevertheless, the bracket–systems that make this possible should command the utmost respect and clinicians who wish to use these new methods should receive proper training in their use.

If a doctor thinks of this new technology only in terms of a bracket and continues to use conventional mechanics and diagnosis, the true benefits of minimizing friction and binding will not become apparent. The big change comes when the clinician utilizes this low force system to expand treatment planning options. This system should encourage doctors to challenge their own thought processes and take their patient care to a higher level.

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