

Orthodontic Insights: Exploring the Damon System

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Abstract

The Damon System is a revolutionary orthodontic treatment that utilizes self-ligating brackets to enhance patient comfort, reduce treatment time, and improve overall efficiency. Unlike traditional braces, the Damon System eliminates the need for elastic or metal ties, allowing for a more natural and friction-free tooth movement. This system promotes a broader arch development, reduces the need for extractions, and often results in a more esthetically pleasing smile. In addition, its innovative design minimizes discomfort and requires fewer adjustments, making it a preferred choice among both orthodontists and patients. This article explores the evolution of self-ligating brackets, the introduction and evolution of the Damon system, its philosophy, bracket positioning, archwire sequencing, and its use in different clinical situations.

Keywords: Damon philosophy, Damon system, Passive self-ligating brackets, Self-ligating brackets.

INTRODUCTION

The field of orthodontics has witnessed remarkable advancements in the 21st century, particularly in bracket technology and treatment mechanics. The Damon System, a passive self-ligating bracket system introduced in 1994 by Dr. Dwight Damon, has transformed orthodontic treatment by reducing friction, minimizing treatment time, and improving patient comfort. This article explores the evolution, philosophy, and clinical application of the Damon System, supported by evidence-based research.^[1]

THE EVOLUTION OF SELF-LIGATING BRACKETS^[2]

The concept of self-ligating brackets dates back to the 1930s with Stolzenberg's Russell attachment. However, early designs faced skepticism and limited acceptance due to mechanical shortcomings. Over the decades, self-ligating brackets have undergone significant refinement, with Dr. Wildman's Edgelok brackets (1972) and the Speed brackets paving the way for modern systems.

The Damon System, introduced by Dr. Dwight Damon, represents a breakthrough by integrating passive self-ligation with high-technology archwires. Unlike conventional brackets that require elastomeric ties, Damon brackets use a sliding mechanism that reduces friction and enhances tooth movement efficiency.

TIMELINE SELF-LIGATING BRACKETS (TABLE 1)

Damon's philosophy and treatment approach

Damon philosophy

The Damon philosophy focuses on biologically sensible, low-force mechanics designed to mimic natural muscle forces on tooth position and arch form development. This approach emphasizes patient comfort, efficiency, and achieving the best possible facial balance through non-invasive treatment methods.

Key Principles of the Damon philosophy^[3]

1. Threshold force concept

Uses minimal forces, just enough to initiate tooth movement without occluding blood vessels in the periodontal membrane.

Maintaining blood flow allows biochemical messengers and cellular activity necessary for bone resorption and apposition, enabling effective and healthy tooth movement.

2. Passive self-ligation

- The Damon System employs a passive, virtually friction-free, self-locking appliance

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Table 1: Depicting timeline of self-ligating brackets

Bracket	Year
Russell Lock	1935
Edgelok bracket	1972
Mobil-Lock bracket	1980
SPEED bracket	1980
Activa bracket	1986
Adenta Time bracket	1996
Damon SL bracket	1996
TwinLock bracket	1998
Damon 2 bracket	2000
In-Ovation bracket	2000
Oyster bracket	2001
In-Ovation R bracket	2002
Evolution LT bracket	2002
OPAL bracket	2004
Damon 3 bracket	2004
SmartClip bracket	2004
Damon 3 MX bracket	2005
OPAL metal bracket	2006
Quick bracket	2006
Glide bracket	2006
Carrière LX bracket	2006
Clarity SL bracket	2007
Vision LP bracket	2007
Discovery brackets	2007
Damon Q bracket	2009
Damon esthetic bracket	2009
Smart clip SL3 bracket	2009
Cabriole Self-Ligating Bracket	2010
Harmony lingual bracket system	2011
Sensation Active Ceramic Bracket	2012
BioQuick Self-Ligating Bracket	2014
Carriere SLX bracket	2014
Empower 2 bracket	2016
In-Ovation X bracket	2017
DAMON Ultima bracket	2021

- Eliminates friction caused by ligatures (elastomeric or steel ties), making tooth movement more efficient
- A low friction environment allows natural adaptation of the arch form while ensuring patient comfort.

3. Archwires and Rotational Control

- High-tech, low-force archwires such as copper nickel-titanium (NiTi) wires are used
- Passive self-ligation allows a small wire-to-lumen ratio, promoting leveling, aligning, and arch adaptation.

4. Reduction of Frictional Resistance

- Studies (Voudouris, Rupali Kapur, Pramod Sinha, Ram Nanda) show that Damon self-ligating brackets produce significantly lower friction compared to conventional brackets.
- Friction with conventional brackets and elastomeric ties is hundreds of times higher than with Damon's passive self-ligating brackets.

5. Reduced need for conventional orthodontic devices
 - Reduced frictional resistance minimizes the use of:
 - Anchorage devices (e.g., headgear and TADs)
 - Intraoral expansion auxiliaries (e.g., quad helices and W-springs)
 - Tooth extractions, as alignment is achieved efficiently without obstructive friction.
6. Extended treatment intervals and fewer visits
 - The use of passive self-ligation allows longer intervals between treatment visits, especially in the early stages
 - Reduced treatment time and visits, enhancing patient convenience and compliance.

TIMELINE OF DAMON BRACKET EVOLUTION^[4] (TABLE 2)

Bracket selection and placement^[5]

The Damon System offers various torque prescriptions to accommodate different malocclusions:

1. High torque brackets

These are used in cases where the incisors or cuspids are severely retroclined or positioned palatally. Examples include:

- Class I extraction cases with proclined incisors
- Class II div 1 malocclusion
- Class II div 2 malocclusion with retroclined incisors
- Palatally positioned incisors or cuspids.

2. Standard torque brackets

These brackets are suitable for cases where the anterior inclination is already satisfactory, and no significant change in inclination is expected during treatment.

3. Low torque brackets

These are used in the following cases:

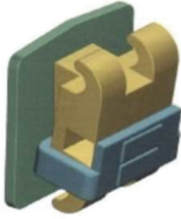
- Cases of anterior open bite with severely proclined anterior teeth
- Cases of moderate-to-severe crowding
- Treatment modalities that may lead to further proclination of the anterior teeth
- Incisors which have palatally displaced roots
- Cases where Class II elastics or fixed functional appliances are used where controlling lower incisor proclination is important
- Cases of lingually placed mandibular incisors.

Bracket placement guidelines

Proper bracket placement is crucial for achieving optimal results with the Damon System. Dr. Damon developed a specific method for bracket positioning to enhance smile arc alignment, functional occlusion, and facial esthetics.

- Green zone concept (Figure 1): Dr. Damon introduced the "Green Zone" method, which ensures brackets are positioned in a manner that optimally distributes forces and minimizes unwanted torque effects. The scribe line of the bracket should align with the long axis of the tooth for precise positioning

Table 2: Depicting the timeline of Damon's bracket evolution

Year	Bracket	Figure	Features
1996	Damon SL (1 st Generation)		Prone to inadvertent slide opening and breakage.
2001	Damon 2		The slide was enclosed between the tie wings. In addition, the use of metal injection molding allowed for tighter tolerances, which significantly reduced the chances of inadvertent slide openings or breakage, leading to a wider adoption of self-ligation
2004	Damon 3		Introduced semi-esthetic design with a combination of clear material and metal. Faced issues such as bond failure and resin-metal separation.
2005	Damon 3MX		Full metal bracket enhances strength, durability, and usability with an improved slide mechanism.
2008	Damon Q		More durable with advanced metal construction, increased efficiency, and improved torque control due to the four walls
2009	Damon Clear		First 100% clear self-ligating bracket; durable, stain-resistant, and comfortable
2014	Damon Clear2		Improved control and esthetics with enhanced slot precision and strength.

(Contd...)

Table 2: (Continued)			
Year	Bracket	Figure	Features
2017	Damon Q2		Improved versatility with drop-in hooks, control, and bonding strength for better efficiency.
2021	Damon Ultima		The latest model with continued enhancements in functionality and esthetics. The adversity of procline and retrocline brackets in the Damon Ultima system can be used to incorporate torque whenever needed.

- Incisal edge distance: Brackets are placed at a precise distance from the incisal edge to ensure proper inclination and torque expression. The upper central incisor bracket is typically positioned 4.75 mm from the incisal edge, whereas lateral incisors are placed at 4.50 mm (Figure 2)
- Smile Arc protection: Brackets are positioned to preserve the natural curvature of the smile. The lateral incisor bracket is placed 0.5 mm gingivally relative to the canine bracket, whereas the central incisor bracket is positioned 0.25 mm gingivally from the lateral incisor
- Posterior bracket positioning (Figure 3): For molars and premolars, the buccal tube pad is aligned with the buccal groove, ensuring proper occlusal plane alignment
- Mandibular bracket placement (Figure 4): Lower incisor brackets are positioned based on the degree of deep bite or open bite. In deep bite cases, the bracket slot is placed 3.5 mm from the incisal edge, whereas in open bite cases, it is placed 5 mm from the incisal edge to facilitate bite opening
- Pitts’ protocol: Dr. Thomas Pitts emphasized beginning with the end goal in mind. His method involves slightly more gingival bracket placement to enhance smile arc protection and ensure optimal facial esthetics. Using reference lines on stone models helps minimize errors during bonding.
- Panoramic X-ray confirmation: Before finalizing bracket placement, panoramic radiographs are used to assess root positioning and angulation, ensuring proper axial inclination.

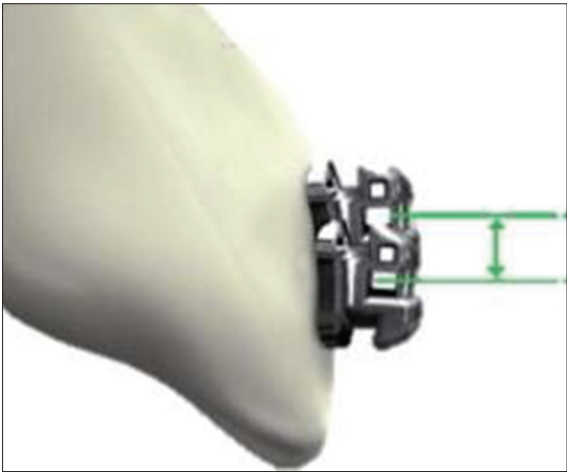


Figure 1: Depicting green zone for precise bracket positioning

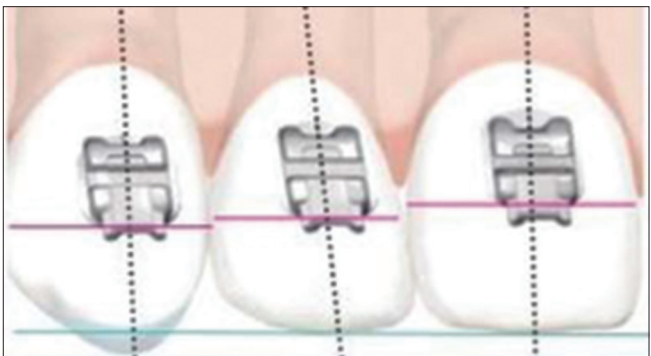


Figure 2: Depicting anterior bracket positioning

ARCHWIRE SEQUENCING AND PHASES OF TREATMENT^[6]

The Damon System follows a structured four-phase archwire progression:

1. Light round wire phase: Initiates alignment with minimal force
2. High-tech edgewise phase: Enhances torque control and root angulation

3. Major mechanics phase: Facilitates space closure and anteroposterior correction
4. Finishing phase: Fine-tunes occlusion and alignment.

Archwires progress from light round NiTi wires to rectangular stainless steel (SS) wires, ensuring controlled and predictable tooth movement.

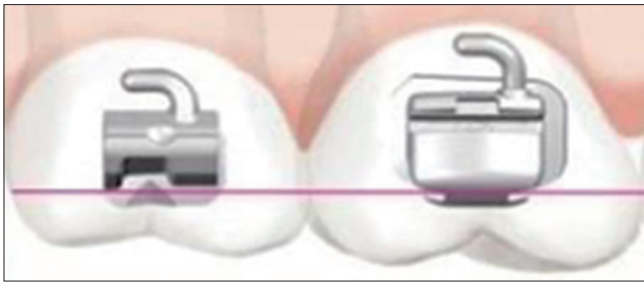


Figure 3: Depicting posterior bracket positioning

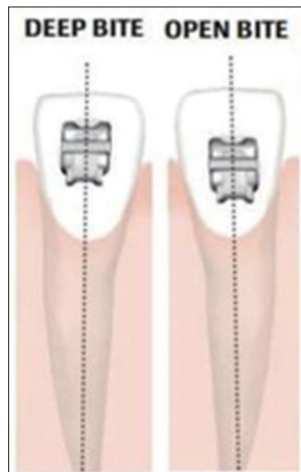


Figure 4: Depicting mandibular incisor bracket positioning

The progression of archwires is carefully selected to apply optimal force at each stage:

- Initial light wires: 0.014 NiTi or 0.016 NiTi wires help with early alignment and leveling
- Transitional wires: 0.016 × 0.025 NiTi and 0.018 × 0.025 NiTi wires initiate torque expression and root positioning
- Working wires: 0.019 × 0.025 SS wires control major mechanics, including space closure and retraction
- Finishing wires: 0.017 × 0.025 TMA wires provide precise detailing and occlusal adjustments.

Each phase aims to optimize tooth movement with minimal force, reducing patient discomfort and promoting long-term stability.

EVIDENCE-BASED RESEARCH ON THE DAMON SYSTEM

Numerous clinical studies have examined the effectiveness of the Damon System:

- Treatment efficiency: Harradine (2001) found that Damon brackets reduced treatment duration by approximately 4 months compared to conventional brackets.^[7]
- Arch expansion: Pandis *et al.* (2009) noted increased intermolar width with Damon brackets, though attributed it to archwire design rather than bracket function.^[8]
- Pain perception: Studies by Scott *et al.* and Pringle *et al.* (2009) indicated no significant difference in pain levels between Damon and conventional brackets.^[9]

- Torque expression: Badawi *et al.* (2008) found that active self-ligating brackets provide better torque control than passive brackets.

While some studies highlight advantages in friction reduction and efficiency, others suggest minimal differences in overall treatment time and discomfort.

RETENTION PROTOCOL^[6]

Post-treatment retention is crucial for maintaining results. The Damon System employs three retention methods:

1. Maxillary retention: A fixed lingual bonded retainer on the upper anterior teeth
2. Mandibular retention: A fixed lingual bonded retainer on the lower anterior teeth
3. Interarch retention: The Damon splint is used in complex cases requiring additional stabilization.

CONCLUSION

It may be concluded that the Damon System is a significant improvement in the field of orthodontic therapy. When compared to the traditional pre-adjusted edgewise system, the Damon system holds a number of advantages, as demonstrated by the numerous studies and pieces of evidence. A number of schools of thought exist on the effectiveness and benefits of the Damon bracket system.

However, despite these differences, the system is still widely recognized. There have been continual developments in the designs of brackets ever since the Damon system was first introduced. These advancements have been made in order to address the shortcomings of each successive generation of brackets and to enhance the effectiveness of the bracket system.

In spite of this, the self-ligating brackets are merely a tool that the orthodontist can use. It is important for the orthodontist to be informed of how to employ various bracket systems and how to make use of the benefits offered by the self-ligating system for a variety of different sorts of situations.

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