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Damon Ultima System

A Project Submitted to

The College of Dentistry, University of Baghdad, Department of orthodontics in Partial Fulfillment for the Bachelor of Dental Surgery

By

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Certification of the Supervisor

I certify that this project entitled "Damon Ultima System" was prepared by the fifth-year student Dhuha Abid Al-Hadi under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

Assist. Prof.

Dr. Mustafa M. Al-Khatieeb

Dedication

All practitioners who are interested in updated orthodontics.

All teachers who left their kind and scientific touches on me.

My family (Mama & Mazin).

This project is dedicated to you all …

Acknowledgements

I would like to extend my deepest respect and gratitude to the Dean of College of Dentistry, University of Baghdad, **Prof. DR. Raghad Al- Hashimi.**

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Finally, I would like to express grateful thanks to my lovely family

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List of Abbreviations

Acronym / Abbreviation	Meaning
NiTi	**Nickel Titanium archwire**
SL	**Self-Ligating**
3D	**3 Dimensional**
MD	**Mesiodistal**
mm	**millimeter**
g	**gram**

Introduction

Introduction

Dr. Robert Keim editor of the Journal of Clinical Orthodontics, stated that " the future of orthodontics will focus on 3 areas: 3-dimensional (3D) imaging replacing 2-dimensional Cephalometry, self-ligating brackets, and micro implants as endosseous anchorage (temporary anchorage device) ". **(Rinchuse et al., 2007)**.

Therefore, Self-ligating (SL) brackets are not new to orthodontic they are resurging from since 1930's with the invention of Boydband bracket. These bracket systems along with the thermally activated NiTi wires have reduced the treatment duration, chair-side time. and improved the treatment efficacy and patient co-operation **(Siva *et al.*, 2022).**

This led to the invention of Damon's system by Dr. Dwight Damon in the year 1996 It is called as "System" rather than "Brackets" because it utilizes the benefits of both the brackets and copper NiTi wires, thus delivering a "low force- low friction" mechanics for the management of dental malocclusion. Some early SL brackets were the Ormco Edge lok (1972), Forestadent Mobil-Lock (1980), Orec SPEED (1980), and "A" Company Activa (1986). SL brackets can be dichotomized into those with a spring clip that can press against the arch wire (active) and those with a passive system of ligation, in which the clip, ideally, does not press against the wire. However, the term "passive" is somewhat of a misnomer because it is passive only when teeth are ideally aligned in 3 dimensions (torque, angulation, and in-out), and an undersized wire would not touch the walls of the bracket slot **(Rinchuse *et al.*, 2007)**.

Examples of active brackets are In-Ovation "R" (GAC International, Bohemia, NY), SPEED (Suite Industries, Cambridge, Ontario, Can-ada), and Time (American Orthodontics, Sheboygan, Wis). Examples in the passive group are the Damon bracket (Ormco.Glendora, Calif) and the Smart Clip

bracket (3M Unitek, Monrovia, Calif). With the Damon bracket, the so called "fourth wall" is comparable to a buccal tube. It seems that SL brackets are not a fad but might be a viable alternative to conventional bracket systems **(Rinchuse *et al.*, 2007).**

Aims of the study

To review efficiency of the system, the various possible outcomes and its influence on the ease of orthodontic therapy.

Chapter one

Review of literature

1.1. The history and development of self-ligating brackets in orthodontic:

The early history of self-ligating brackets can be traced back to the 1930s when Dr. Edward H. Angle, the father of modern orthodontics, first began experimenting with the use of self-ligating brackets. However, it was not until the 1970s that the first commercially available self-ligating brackets were introduced. These were designed by Dr. Larry Andrews, an orthodontist based in San Diego, California **(Katsikogianni, 2014)**.

Dr. Andrews' self-ligating bracket system was called the "Speed Braces" and was a significant improvement over the traditional brackets of the time. The Speed Braces used a spring clip to hold the archwire in place, which eliminated the need for elastic or metal ligatures. This resulted in reduced friction, which in turn allowed teeth to move more freely, leading to faster treatment times and increased patient comfort **(Andrews, 2001)**.

The introduction of Dr. Andrews' self-ligating brackets was a breakthrough in the field of orthodontics. They allowed for greater control and precision in the movement of teeth, and they made orthodontic treatment more comfortable and convenient for patients. Over time, other manufacturers began to develop their own self-ligating brackets, each with their own unique features and benefits **(Fleming *et al.*, 2015).**

Today, there are many different types of self-ligating brackets on the market, each with its own advantages and disadvantages. Some are designed to be more aesthetically pleasing, while others are focused on achieving faster treatment times. There are also different materials available, such as ceramic or clear plastic, which can help make the brackets less noticeable **(Siva *et al.*, 2022)**.

Despite the many advances that have been made in the field of orthodontics, self-ligating brackets continue to be a popular choice for both orthodontists and patients. numerous orthodontic organizations have fostered their own bracket systems with specific prescriptions, treatment philosophies, and mechanics. Nonetheless, they all had one common regular trademark – ligatures should be put around tie wings on brackets to hold archwires in the bracket slot

(Harradine, 2008).

Regardless of the type of bracket and ligation used, there are several desirable properties for an ideal orthodontic ligation system given by **(Harradine, 2008):**

- Be secure and robust
- Ensure full bracket engagement of the archwire
- Exhibit low friction between the bracket and arch wire
- Be quick and easy to use
- Permit easy attachment of elastic chain
- Assist good oral hygiene
- Be comfortable for the patient

1.1.1. Secure and robust ligation

Secure, full arch wire engagement maximizes the potential long range of action of modern low modulus wires and minimizes the need to regain control of teeth where full engagement is lost during treatment.

1.1.2. Full Bracket Engagement

It is a great advantage if the arch wire can be fully engaged in the bracket slot and maintained there with certainty. Wire ligatures do not stretch to an extent that engagement once achieved at ligation is subsequently lost, so they can meet this requirement.

Elastomerics are worse since they may frequently exert insufficient force to fully engage even a flexible wire and the subsequent degradation of their elastic performance may cause a significant loss of full engagement as the elastomeric stretches.

1.1.3. Low Friction

Wire ligatures produce substantially lower friction forces than elastomerics. However, the forces generated by wire ligation still reach high and very variable levels relative to those force levels that are thought to be optimal for tooth movement. It is perhaps helpful at this point to summarize why low friction levels are considered to enhance orthodontic tooth movement. Most tooth movements with most mechanical procedures involve relative movement between the arch wire and bracket. These movements include leveling, buccolingual alignment, rotation, correction of angulation, opening of space, and any space closure with sliding mechanics. Friction between the bracket and the arch wire is a force that must be overcome before the intended tooth-moving forces can have their effect and this relative movement between the bracket and the arch wire can occur.

1.1.4. Quick and easy ligation

Wire ligation is a lengthy procedure and this is the main reason they are not frequently used. Elastic ligatures are much faster to remove and replace.

1.1.5. Improves patient comfort and hygiene

Wire ligatures can cause tissue laceration if the cut ends are exposed but they are very hygienic. Elastic ligatures are more comfortable than wire ligatures but have the side effect of being less hygienic.

1.2. Conventional brackets vs self- ligating brackets

(Birine, 2008) and **(https://damonbraces.com/en-us/why-damon)** compared between Damon's bracket and conventional pre-adjusted edgewise appliances, they suggested that the use of passive self-ligation results in a significant reduction in :

● the passive self-ligating appliances use less anchorage than conventional appliances, this is related to the absence of frictional resistance generated by ligatures and This supports the reduction in the use of anchorage devices experienced by users of passive self-ligation.

● Use of intraoral expansion auxiliaries such as Quad-helices or W-springs because the force of the archwire is not transformed or absorbed by the ligatures and the necessary expansion can be achieved by the force of the archwires.

● Need for extractions to facilitate orthodontic mechanics because alignment is not hindered by frictional resistance from ligatures and can therefore largely be achieved with small diameter Copper NiTi archwires. Tooth alignment therefore places minimal stress on the periodontium as it occurs and so the possibility of iatrogenic damage to the periodontium is reduced.

1.3. The Value of Self-Ligating Brackets in Orthodontics: About the Damon's Protocol

Dr. Dwight Damon gives a full description of his philosophy and treatment techniques which are based on the principle of using just enough force to initiate tooth movement " the threshold force " The underlying principle behind the threshold force is that it must be low enough to prevent occluding the blood vessels in the periodontal membrane to allow the cells and the necessary biochemical messengers to be transported to the site where bone resorption and apposition and thus permit tooth movement **(Birnie, 2008).**

the passive self-ligation mechanism has the lowest frictional resistance of any ligation system in which the forces generated by the archwire are transmitted directly to the teeth and supporting structures without absorption or transformation by the ligature system. The forces generated by elastomeric ligatures may have unwanted side effects on treatment progress **(Birnie, 2008)**.

1.3.1. Type of arch wire used in the system

The Damon Ultima System is designed with proprietary round-sided rectangular Nickel titanium archwires, also known as NiTi arch wires, made of a blend of nickel and titanium (**https://ormco.com/products/damon-ultima-system/)**.

This material is highly elastic and flexible, allowing for continuous gentle force to be applied to the teeth. NiTi archwires are commonly used in the early stages of orthodontic treatment when teeth are in the early stages of movement. One of the significant advantages of using NiTi archwires is that they can reduce overall treatment time. This is because NiTi archwires can maintain a constant level of force, allowing for more efficient tooth movement. Additionally,

because NiTi archwires are more flexible than stainless steel arch wires, they can better adapt to the curvature of the teeth, providing better control over tooth movement **(Kotha *et al.*, 2014)**.

NiTi archwires are available in different shapes and sizes, allowing orthodontists to choose the most appropriate arch wire for each patient's unique needs. For example, some NiTi archwires are heat-activated, meaning they can be bent and shaped when heated, and then return to their original shape when cooled. This allows for better customization of the arch wire to suit each patient's specific orthodontic needs **(Eliades *et al.*, 2017)**.

Another advantage of using NiTi archwires is that they are less likely to cause discomfort than stainless steel arch wires. This is because NiTi archwires apply a more continuous and gentle force, reducing the pressure on the teeth and making orthodontic treatment more comfortable for the patient

(Wang *et al,* 2018).

1.3.2. Arch wire sequencing

According to **(Siva *et al.*, 2022)** phases of tooth movement are generally:

- Initial leveling and aligning: where initial round wires made of multistranded steel or NiTi are used, starting from the smaller dimensions and then proceeding with the larger dimensions.

- Retraction and space closure: where rigid rectangular wires are used for major mechanics like torque expression and space closure.

- Finishing and detailing: round steel wires are usually used.

Figure 1: Damon Ultima archwires (https://ormco.com/en-us/damon-ultima)

1.3.3. Arch wire Placement and Removal

According to **(Damon and Bagden, 2008),** archwires can be inserted with the fingertips and the slides will close easily either with a finger or with a Damon Universal Plier. Alternative techniques for wire insertion and slide closure also have been given by (**Damon and Bagden, 2008)** including:

Damon Cool Tool™

The Cool Tool can be used to seat arch wires to make closing brackets easier. Cooling the instrument will temporarily "soften" the Copper NiTi wires and is useful for severe rotations. **See Figure (2)**

Ligature Director

In cases with severely rotated teeth, a ligature director may be an ideal tool to seat the archwire. **See Figure (3)**

Damon Closing Tweezer™

the top part of the tweezer is used to seat the wire in the slot and simply squeeze the tweezer to close the bracket slide. **See Figure (4)**

Figure 2: Damon cool tool

(Damon and Bagden, 2008)

Figure 3: Ligature Director

(Damon and Bagden, 2008)

Figure 4: Damon closing tweezer

(Damon and Bagden, 2008)

1.3.4. The bracket design

Damon Ultima was designed and introduced for faster and more precise finishing. Traditional passive self-ligating brackets and wires have significant play which generally results in poor control, manual adjustments, and extended treatment time (**https://ormco.eu/products/brackets/self-ligating/damon-ultima)**.

The enhanced features in Damon Ultima ™© given by (**https://ormco.com/products/damon-ultima-system**) are as follows:

• Completely re-engineered tie-wing is said to improve the ability to engage and ligate elastomeric chains. **See Figure (5)**

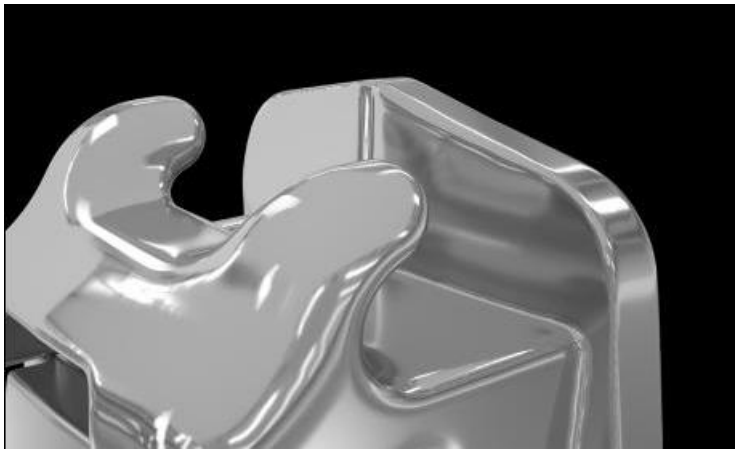

Figure (5): Completely reengineered tie-wing

(https://ormco.com/en-us/damon-ultima)

• Smoother tie wings were designed for better patient comfort and minimal occlusal interference. **See Figure (6)**

Figure (6): Smoother tie wings

(https://ormco.com/en-us/damon-ultima)

• The base with 80 gauge mesh is designed for reliable and increased bond strength throughout treatment and a predictable debonding experience. **See Figure (7)**

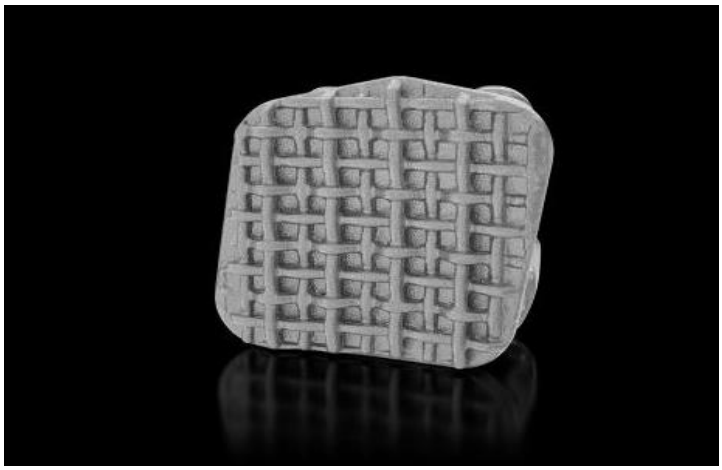

Figure (7): Bracket base

(https://ormco.com/en-us/damon-ultima)

• Easy to open and close the slot door design with low reciprocal forces and tactile feedback. The bracket door and wire are designed to reduce door closure interference. **See Figure (8)**

Figure (8): Slot door design

(https://ormco.com/en-us/damon-ultima)

• Rhomboid-shaped pad with enhanced scribe line help in guiding bracket placement. **See Figure (9).**

Figure (9): Rhomboid shaped pad

(https://ormco.com/en-us/damon-ultima)

• Presence of vertical slot for convenient placement of drop-in hooks. **See Figure (10)**

Figure (10): Ultima bracket slot

(https://ormco.com/en-us/damon-ultima)

1.3.5. Bracket selection and placement in Damon system.

General Placement tips given **(Siva *et al*, 2022)** include:

• The upper brackets open occlusally and the lower brackets open gingivally.

• The mesiodistal width of the pad and the mesiodistal edges of the teeth should be given importance.

• Panoramic view before bracket placement allows identifying root position.

• The internal slot and the horizontal components should be parallel to the occlusal plane. This is of greater importance in the lower anteriors.

• The scribe line of the bracket and crown long axis should be focused while placing the bracket.

According to Dr. Pitt's occlusogingival positioning of brackets is slightly more gingival to the conventional placement on both arches. He believed positioning the brackets more incisally will prevent us from achieving the ideal smile arc and hinders torque control **(Siva *et al*., 2022)**.

Dr. Pitts along with Dr. Mike Steffan developed a method to make the bracket positioning easier by drawing lines on the stone models from contact points for the canine, premolars, and molars to prevent mistakes in bracket positioning **(Nojima *et al*., 2015)**.

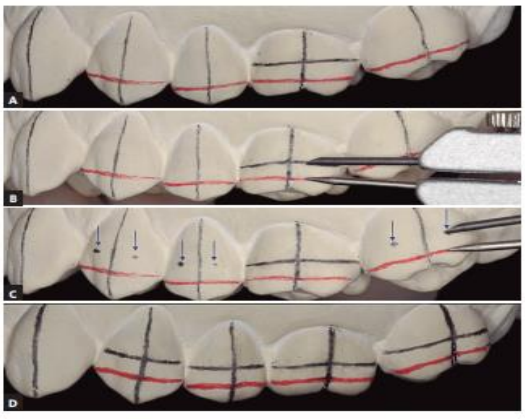

Figure (11): Marking the contact points for occlusogingival positioning of brackets (Siva *et al.*, 2022)

1. Maxillary anteriors

The position of the maxillary canine is given prime importance for the sweep in the smile arc. Based on the positioning of this bracket, other anterior brackets were placed. In this method, the incisal edge of the canine bracket wing needs to be placed on a line drawn from mesial to distal contact at the height of contour interproximally. This line was called the mesiodistal (MD) contact line. The level of the slot of this bracket was used as a reference for maxillary central and lateral incisor positioning. The maxillary lateral incisor bracket is placed 0.5 mm gingival to the canine bracket and the central incisor bracket 0.25 mm gingival to this to achieve the ideal smile arc **(Siva *et al*., 2022).**

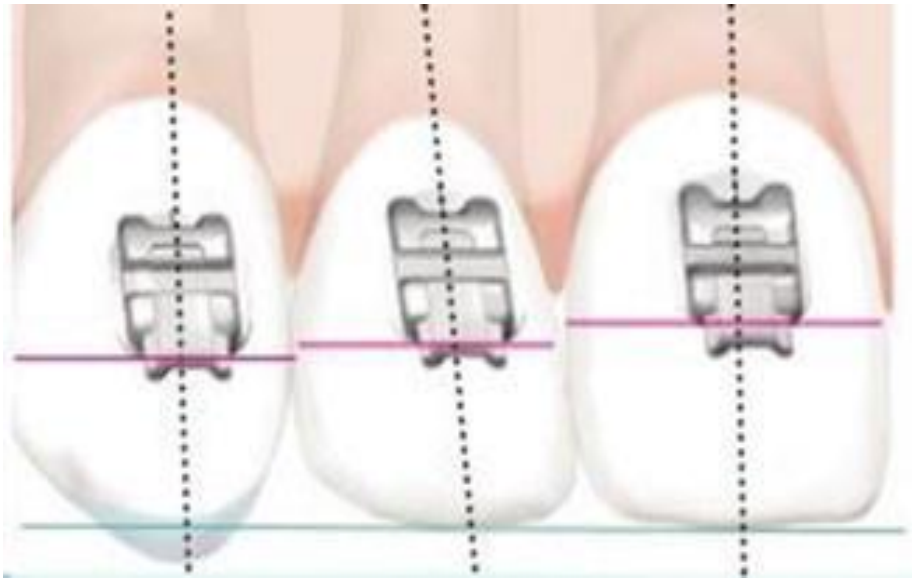

Figure (12): Bracket positioning in the maxillary incisors and canines (Siva *et al.*, 2022)

2. Maxillary premolars

The maxillary premolars are positioned by aligning the scribe line with the crown long axis at the height of contour paralleling the central groove and the MD buccal line angle. Following correct bracket placement, the bracket on the first premolar would seem too distal to the height of contour and the second premolar at times would appear mesial to the height of contour when viewed from the buccal aspect. The occlusal edge of the brackets should touch the MD contact line **(Siva *et al*., 2022).**

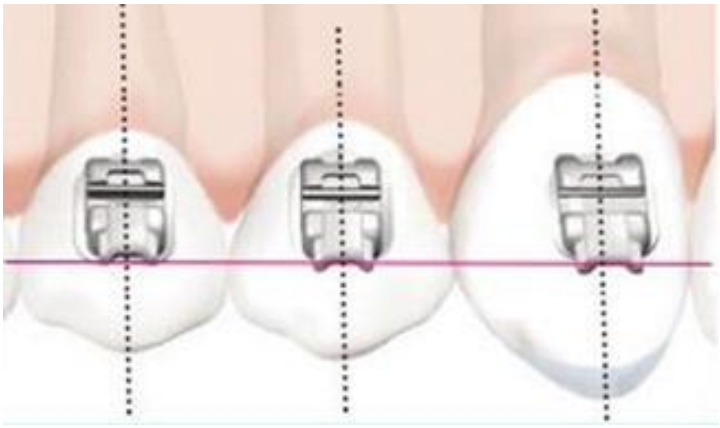

Figure (13): Bracket positioning in the maxillary premolars (Siva *et al.*, 2022)

3. Maxillary molars

The mesiodistal positioning of the buccal tube is done by centering the buccal tube pad over the buccal groove of the teeth and the occluso gingival positioning is done by placing the occlusal edge of the pad on the MD contact line of the first molar. The second molars follow the same rule for mesiodistal positioning but are placed 1.5 mm more occlusally to the first molar tube **(Siva *et al*., 2022)**.

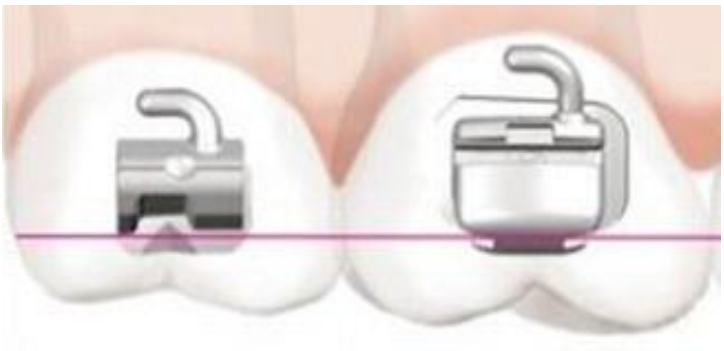

Figure (14): Bracket positioning in the maxillary molars (Siva *et al.*, 2022)

4. Mandibular incisors

The mandibular incisors are placed such that the scribe line is aligned with the long axis of the tooth. The bracket position according to **(Siva *et al.*, 2022)** is viewed from the incisal aspect.

- For deep bite, the position of the top of the slot is 3.5 mm from the incisal edge to reverse the curve of spee.
- for open bite, the position of the top of the slot is 5 mm from the incisal edge to open the curve of spee.

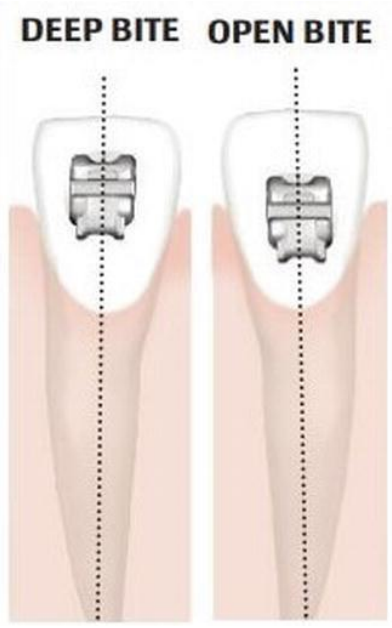

Figure (15): Bracket positioning in the mandibular anteriors

(Siva *et al.*, 2022)

5. Mandibular canines

The mesiodistal positioning is done by aligning the scribe line to the long axis of the crown at the height of contour. The position is verified by viewing from the incisal aspect. The occlusogingival positioning is placing the incisal edge of the bracket wing at the MD contact line **(Siva *et al*., 2022).**

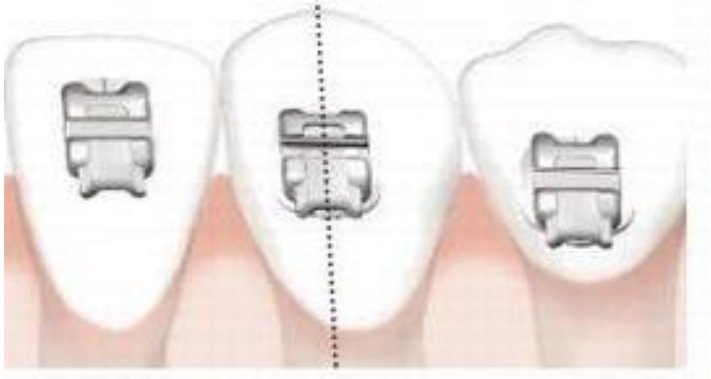

Figure (16): Bracket positioning in the mandibular canine (Siva *et al.*, 2022)

6. Mandibular premolars

The mesiodistal positioning is done by aligning the scribe line to the crown long axis and viewing from the occlusal aspect. The occlusogingival positioning is based on positioning the occlusal edge of the bracket wing 0.5 mm gingival to the MD contact line **(Siva *et al*., 2022)**.

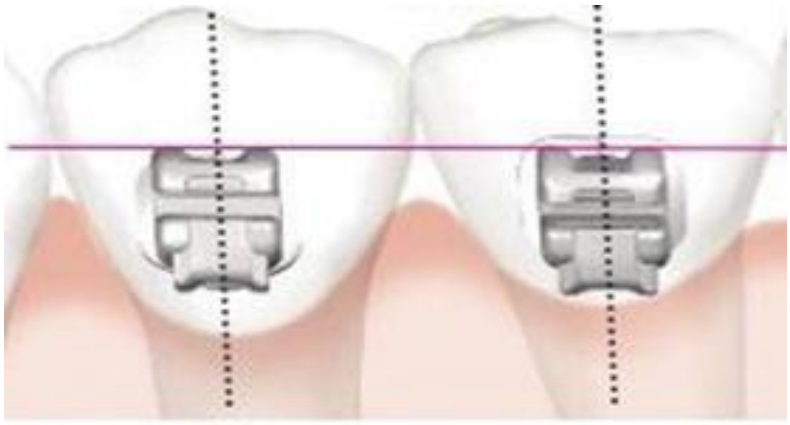

Figure (17): Bracket positioning in the mandibular premolars (Siva *et al.*, 2022)

7. Mandibular molars

The mandibular molars are placed in the same way as the maxillary molars in terms of mesiodistal positioning by orienting the center of the buccal tip of the buccal tube with that of the buccal groove of the tooth. Unlike the maxillary molars, both the mandibular molars are placed at the same height, which is 0.5 mm gingival to the MD contact line **(Siva *et al*., 2022).**

Figure (18): Bracket positioning in the mandibular molars (Siva *et al.*, 2022)

1.4. Classifications of Damon's brackets

The Damon System provides several torque options for incisor and cuspid teeth. In general, the torque selected in each bracket should be designed to over-correct tooth position **(Siva *et al*., 2022).**

This classification given by **(Harradine., 2008):**

High Torque Brackets

high torque brackets may be required for

❖ upper incisors in the following cases:

● Extraction cases where treatment mechanics may excessively retrocline the upper incisors.

● Class II Division 1 malocclusions where treatment mechanics may excessively retrocline the upper incisors

● Class II Division 2 malocclusions.

❖ upper cuspids in cases of:

● First premolar extraction cases

● Cases where the crowns of the upper cuspids are palatally tipped.

Figure (19): high torque bracket placement

(https://Damon-Torque-and-Bracket-Placement-Guide)

Standard Torque Brackets

Standard torque brackets are used where the inclination of the teeth is satisfactory before treatment and the treatment mechanics will not adversely affect the inclinations during treatment.

Low Torque Brackets

low torque brackets are required for

❖ upper incisors in the following cases:

● Excessively proclined upper incisors

● Isolated upper incisors with palatally positioned roots (e g, upper lateral incisor in the palate)

● Malocclusions where treatment mechanics may result in excessive upper incisor proclination

● Moderate and severe upper arch crowding

● Anterior open bite cases with proclined incisors.

❖ Lower incisors in the following cases:

● extreme lower labial segment crowding

● cases using Class II elastics

● fixed Class II correctors attached to the brackets, buccal tubes, or arch wire

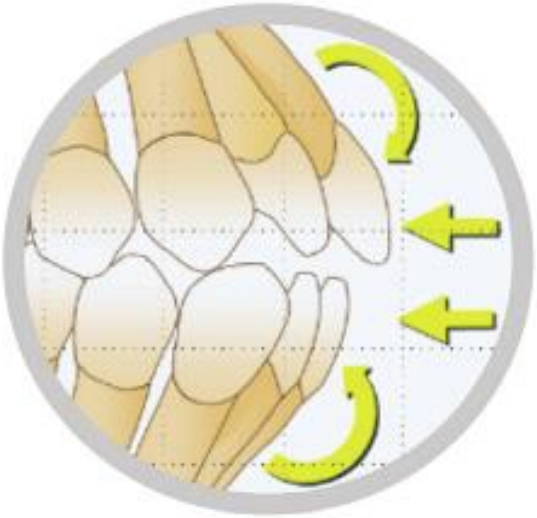

Figure (20): low torque bracket placement (https://Damon-Torque-and-Bracket-Placement-Guide)

1.5. Treatment Phases

Phase 1: Light Round High Technology Wires (0.013 mm), (0.014 mm**)** or (0.016 mm) Copper NiTi archwires. The aims of this phase of treatment are to:

● Obtain teeth alignment

● Level the arches (excluding second molars).

Second molars, although bonded from the start of treatment, are not engaged by the initial archwire until the second phase of treatment to prevent the archwire from being dislodged from the second molar tubes. The intertube span between the first molar and second molar is too large to reliably support small-diameter NiTi archwires **(Birnie., 2008)**.

● Substantially correct all anterior rotations and partially correct posterior rotations.

● Initiate arch development by using light enough forces to allow the soft tissues to influence arch shape.

This phase of treatment normally lasts 10 to 20 weeks and appointment intervals are at 10 weeks **(Siva *et al*., 2022).**

Phase 2: High Technology Rectangular Wires The second molars are normally engaged by the first arch wires in this phase except in patients with anterior open bites. This phase of treatment normally uses two archwires: (0.014 x 0.025 mm) followed by (0.018 x 0.025) mm copper NiTi wires. In cases that are well aligned at the start of treatment,

these two Archwires can occasionally be replaced by a single (0.016 x 0.025 mm) copper NiTi wire. The use of a wire with a (0.025 mm) first-order dimension is critical to obtain tooth alignment by almost filling the (0.027 mm) slot depth of a Damon bracket.

Where incisor intrusion is required (0.017 x 0.025 mm) or (0.019 x 0.025mm) copper NiTi archwires with performed curves or reverse curves of Spee can be used in this stage **(Birnie., 2008).**

Additional torque can also be applied at this stage with the use of (0.019 x 0.025 mm) copper NiTi archwire performed with 20° of torque anteriorly.

The aims of this stage of treatment are to:

- Fully correct all rotations and obtain full alignment of all teeth
- Consolidate any anterior space and maintain tooth contact
- Initiate torque control
- Initiate bite opening
- Continue arch development.

The duration of this phase of treatment is 20 - 30 weeks. The first arch wire is left in place for 8 to 10 weeks and the second for 4 to 6 weeks **(Siva *et al.*, 2022).**

Phase 3: Major Mechanics The archwires used in this phase are (0.019 x 0.025 mm) preposted stainless steel archwires. Many buccal segment crossbites will have corrected spontaneously by this stage, particularly when the crossbite has not included the second molars. Where buccal segment crossbites persist, the use of a (0.016 x 0.025 mm) preposted stainless steel arch wire in the arch where some buccal or lingual tipping is desired, together with the use of a 3/16 (110 g) cross elastic, will assist crossbite correction **(Birnie., 2008).**

The aims of this phase of treatment are to:

- Maintain the arch form developed in the first two phases
- Finish torque control
- Consolidate posterior space
- Completely correct anteroposterior, buccolingual, and vertical relationships.

This phase of treatment lasts 8-10 weeks with appointments at 10-weekly intervals. Where Class II or Class III elastics are being used, buccal segment correction occurs more quickly if the molar distal to those to which the elastic is placed are temporarily not included in the archwire **(Siva *et al.*, 2022).**

Phase 4: Finishing and Detailing

The stainless steel archwires may be continued in this phase. However, some detailed adjustments to individual teeth may be required, in which case (0.019 x 0.025 mm) NiTi archwires allow individual adjustments to be made in the arch wire to optimize tooth positions. settling elastics may be used to develop a well-interdigitated occlusion **(Birnie., 2008)**.

1.6. Indications " ideal cases for using Damon Ultima System "

Ideal cases for using Damon's system according to **(Siva *et al*., 2022)** are**:**

- **Class I**

1. Non-Extraction –Adult & Young patients with severe crowding and a flat profile.
2. Non Extraction – Adult & Young patient - Open bite with posterior crossbite and very narrow deep palate.
3. Extraction- Bimaxillary protrusion and crowding.

- **Class II**

1. division I subdivision with functional shift- Non-Extraction.
2. division I- Severe crowding and deep bite.
3. division II- Severe crowding and deep bite.

- **Class III**

1. Severe crowding cases.

The treatment objectives in Damon's cases (focuses on facial esthetics as a critical foundation for diagnosis) given by **(Siva *et al.*, 2022)** are:

- Gain maxillary and mandibular arch length.
- Establish upper and lower incisor positions to give lip support.
- Establish maxillary and mandibular posterior arch width to support mid-face.
- Establish an ideal maxillary lip-to-tooth relationship.
- Design treatment mechanics to eliminate the need for higher force rapid palatal expansion.
- With low-force mechanics work with the orofacial muscle complex, bone, and tissue to establish a physiologic tooth position.

1.7. Advantages

1. Limitations in the use of intraoral expansion appliances such as quad-helix or jack-screw as the optimal forces from the archwires completely allow the connective tissue and alveolar bone to follow tooth movement with uninterrupted vascular supply to the tooth and its surrounding system thereby providing the necessary expansion (**Capenakas *et al.*, 2021)**.
2. A study stated that Damon System produced a significant transversal increase in the posterior region of the arches with differences in teeth buccolingual inclinations at post-treatment **(Srinivas., 2003)**.
3. Faster alignment of teeth as passive self-ligation produces lower resistance thus allowing a wire to slide **(Siva *et al.*, 2022)**.

4. Reduced amount of pain and discomfort experienced by patients, and higher treatment efficiency as this friction-free system produces less force on the teeth **(Turnbull and Birnie., 2007).**
5. Reduction in the need for extraction, as the force applied, is minimal that the pressure from lips can control unwanted tipping of incisors during the alignment stage **(Capenakas *et al*., 2021)**.
6. Decreased demand for the use of anchorage devices compared the conventional appliances as there is reduced friction between the ligation for better tooth control **(Malik *et al*., 2020)**.
7. Reduction in the overall duration of orthodontic treatment by up to 7 months also reduced the number of appointments and ligation time have been found in few researches **(Eberting *et al*., 2001)**.
8. Control of tooth position because there is an edgewise slot of adequate width and depth **(Birnie., 2008)**.
9. Promotes periodontal health with better infection control. (https://www.aaoinfo.org/treatments-and-technologies/damon-system-braces/)

1.8. Disadvantages

According to **(Siva *et al*., 2022):**

1. More Expensive than traditional braces
2. “Metal Mouth” look.

1.9. Efficiency and treatment outcomes of Damon Ultima system

The efficiency of treatment mechanics has been a major focus throughout the history of orthodontics, the basic premise of the self-ligating bracket is that the closing or opening mechanism of the bracket turns the bracket slot into a tube that passively or actively contains the wire. In the absence of wire or elastomeric ties, presumably frictional resistance is dramatically reduced and tooth movement occurs at a greater velocity **(Eberting *et al*., 2001).**

Initial reports have indicated that Damon SL brackets made archwire placement easier and reduced the frictional forces. Damon further states that the bracket design serves as a 'mini lip-bumper' and that the forces of the lips and cheeks help move the teeth to their physiologic positions **(Damon., 1998)**.

When this factor is added to the frictionless situation that exists between the archwire and the bracket, the oxygen tension in the periodontium is uncompromised by the decreased vascular supply normally seen in tooth movement. Because periodontal remodeling is not constrained, the treatment time is reduced. Indeed, chair time was noted to be substantially decreased by an average of 7 min per patient. In addition, the support staff report that self-ligating brackets are easy to use, reduce time and enhance infection control **(Thomas *et al*., 1998)**.

CHAPTER TWO
DISCUSSION/ COMMENTS

1.1. Discussion /Comments

" I would encourage clinicians not to look at this technology as only a new bracket " Dwight Damon stated that it's not just a bracket it's a system depending on a philosophy including the interaction between the characteristics feature of nickel-titanium archwire and the advanced design of the Ultima bracket, which produce: (https://ormco.eu/products/brackets/self-ligating/damon-ultima/

Rotation Control

As The round-sided rectangular Damon Ultima wire engagement at the horizontal contact points delivers earlier rotation control.

Angulation Control

Which is then resolved earlier with vertical contacts.

Torque Control

Engagement at vertical contact points delivers torque control and full expression of the prescription with lighter forces.

All these points Show a superior improvement in patient co-operations, comfortable, and oral health. And also reduce treatment time and visit intervals.

As for the philosophy behind the Damon Ultima System, it is rooted in the idea that orthodontic treatment should not just be about straightening teeth, but should also focus on improving the overall health and function of the patient's bite. Tooth movement just initiated by minimum forces applied by the archwire to avoid occluding of blood vessels within the periodontium and thus permit the biochemical mediators to do their action where the bone remodeling takes place.

Chapter Three
Conclusion and Suggestion

3.1. Conclusion

The Damon Ultima System is an orthodontic treatment system that uses SL brackets and high-technology archwires to move teeth more efficiently than traditional braces. According to some clinical studies, the Damon system can reduce treatment time by up to six months compared to traditional braces.

Furthermore, the Damon system's SL brackets eliminate the need for elastic or metal ties that are used with traditional braces, making it easier to keep the teeth clean and reducing the likelihood of plaque buildup.

Overall, the Damon Ultima System has shown promising results in terms of treatment efficiency, reduced treatment time, and improved oral hygiene. However, as with any orthodontic treatment, the effectiveness of the system may vary depending on the patient's individual needs and the orthodontist's experience and skill level.

3.2. Suggestions

1. Conducting a questionnaire for orthodontists about using this system.
2. Doing a clinical trial about this system.
3. Doing comparative studies to compare Damon's system with other self- ligating systems.

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