3M Self-Ligating Bracket Overview
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  - Hygiene
  - Chair Time Savings
  - Frictional Resistance
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  - Lighter Forces
- What is Self-Ligation?
- Self-Ligating Designs
  - Past Challenges with Self-Ligation
  - Bracket Designs
  - 3M Self-Ligation
History of Self-Ligation
The self-ligation concept is not new

- The first self-ligating concepts were developed in 1935 and the brackets have continued to evolve over time

- Today, self-ligating brackets represent the fastest growing orthodontic bracket segment
## History of Self-Ligation

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1935</td>
<td>Russell Lock</td>
</tr>
<tr>
<td>1971</td>
<td>Wildman (Edgelok); Button capped bracket opened vertically first passive slot</td>
</tr>
<tr>
<td>1975</td>
<td>Hanson: Speed™ (Stride); Narrow single design, difficult to control rotations and finish, technique sensitive</td>
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<tr>
<td>1980</td>
<td>Forestadent Mobil-Lock; Common mechanism failure</td>
</tr>
<tr>
<td>1986</td>
<td>Pletcher (Activa) A’ Co; Difficult mechanism to manage</td>
</tr>
<tr>
<td>1995</td>
<td>Time™ (Adenta/American Ortho); Single wing design, non-mesh base, large bracket</td>
</tr>
<tr>
<td>1995</td>
<td>TwinLock (Wildman) Ormco; Precursor to the eventual Damon™ III design</td>
</tr>
<tr>
<td>1996, 1999</td>
<td>Damon™ (A Co.); Single wing design, large external sliding door, multiple malfunctions</td>
</tr>
<tr>
<td>2000</td>
<td>Damon™ II (Ormco); Single wing design, reduced size from original same issues</td>
</tr>
<tr>
<td>2000</td>
<td>In-Ovation® (GAC); Single bracket, large size frequent clip failure</td>
</tr>
<tr>
<td>2003/2004</td>
<td>In-Ovation-R™ (GAC) 2003/2004; Single more functional clip closed better, reduced size</td>
</tr>
<tr>
<td>2004</td>
<td>SmartClip™ Brackets (3M Unitek); First true twin-wing design, novel ligating mechanism, high clip forces</td>
</tr>
<tr>
<td>2004</td>
<td>Damon III™ (Ormco); 2004 Single bracket door shut better, rhomboid angulation, improved mechanism</td>
</tr>
<tr>
<td>2004</td>
<td>Time 2 (Adenta/American); Single bracket, clip moves easier</td>
</tr>
<tr>
<td>2006</td>
<td>Damon™ Mx (Ormco); Combination metal/polycarbonate material for aesthetics</td>
</tr>
<tr>
<td>2006</td>
<td>SmartClip™ Brackets (3M Unitek); Improved clip forces</td>
</tr>
<tr>
<td>2007</td>
<td>Clarity™ SL Brackets (3M Unitek); Ceramic version of SmartClip Bracket, further improved clip forces</td>
</tr>
<tr>
<td>2009</td>
<td>SmartClip™ SL3 Brackets (3M Unitek); Further clip force reduction</td>
</tr>
</tbody>
</table>

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Benefits of Self-Ligation
Clarity™ SL and SmartClip™ SL3 Self-Ligating Brackets

Improved Hygiene

- Ligatures can retain food particles around the bracket
  - This makes it more difficult for patients to keep teeth clean and maintain effective oral hygiene
- Ligatures are made of an elastomeric material that stains over time from food products
- Self-ligating brackets reduce the need to use ligatures, thus providing improved oral hygiene
Chair-Time Savings

Doctors save time with self-ligation

1. **Archwire changes are shorter because they do not have to remove and re-tie ligatures** (See wire comparison videos from Dr. Sondhi on 3MUnitek.com)

2. **Chair-time may be reduced as patients no longer debate about what color of AlastiK™ Ligature to choose**
What is Friction?

Friction

- The resistance to *motion* when one object moves against another

- Examples include the archwire sliding in the bracket slot, and, brackets sliding on the archwire
Frictional Resistance

- **Ligated Appliances**
  - Must secure/ligate the archwire
  - *This imparts a frictional resistance with AlastiK™ and/or SS Ligatures*

- **Self-Ligating Appliances**
  - Alternative for archwire ligation
  - Reduces or eliminates frictional resistance
    - *Active Mechanism*
    - *Passive Mechanism*
Frictional Resistance

- Ligated brackets have more frictional resistance than self-ligating brackets due to the addition of ligatures
- Imagine driving your car with the emergency brake on . . .
  - The ligatures act as the brake
  - Driving with the emergency brake engaged requires more force to move the car
- With ligated systems, doctors need to use higher forces to overcome the frictional resistance generated by the ligature
Biological Resistance

Self-Ligating appliances move teeth with light forces

- Teeth move within the bone more efficiently when lighter forces are employed
- Heavier forces can cause the periodontal ligament (cells) to react in such a way that it restricts tooth movement
**Lighter Forces**

<table>
<thead>
<tr>
<th>Ligated Brackets</th>
<th>Self-Ligating Brackets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological Resistance + Ligature Friction = Force needed to move teeth</td>
<td>Biological Resistance - Ligature Friction = Force needed to move teeth</td>
</tr>
</tbody>
</table>

**Greater force** needed to account for ligature friction

Less force needed  Ligature Friction is Eliminated

Self-ligating brackets reduce the friction, thus, less force is needed to move the teeth.
Benefits of Light Forces

- Light forces optimize cell stimulation which improves tooth movement (biomechanics)
- Light forces are achieved through the interaction of the brackets’ Rx, design (twin bracket with clips) and the archwire
- The lighter forces and reduced friction offered by self-ligation may allow teeth to level and align faster
  - This may result in faster overall treatment times
SmartClip™ SL3 Self-Ligating Appliances
Friction in Treatment

- Light force initial archwires ensure patient comfort and assist in improved physiological response to accelerate leveling and aligning
- “Active on Demand” feature gives the ability to apply friction where needed with the use of ligature ties
  - *Aids in effective anchorage, detailing and finishing*
Biomechanics and Light Forces in relation to the MBT™ Versatile+ Appliance System

- The MBT™ Appliance System’s reduced angulations result in lighter forces to achieve the same mechanics.
- The clips provide lower friction which supports the light force mechanics of the MBT Appliance System.
- Lighter forces improve cell stimulation which creates more efficient tooth movement and sliding mechanics.
Biomechanics and Light Forces

- Compatible with multiple treatment disciplines without major treatment changes
  - *Roth*
  - *Ricketts*

- Integration of Variable Prescription Orthodontics
  - *Patient Centered Treatment Solution*

* No endorsement by the Doctor is implied
Clarity™ SL and SmartClip™ SL3 Self-Ligating Brackets

Self-Ligating Bracket Designs

Innovative Self-Ligation Technology

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Self-Ligating Bracket Designs

- Two types of self-ligating brackets
  - Passive
  - Active

- Passive
  - No frictional force on the archwire, regardless of archwire size or material
  - Archwire remains passive within the bracket slot regardless of its size

- Active
  - With a large archwire, ligating mechanism imparts a frictional force on the archwire
Self-Ligating Bracket Designs

Damon™ Mx Bracket

Clarity™ SL Bracket

In-Ovation® C Bracket

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SmartClip™ SL3 Bracket -- Key Features

- No moving parts
- “Active on demand”
- Pre-programmed release for excessive force
- Most like Edgewise bracket in appearance
- Tooth-specific bracket bases
- Easy AlastiK™ Ligature placement
- APC™ PLUS and APC™ II Adhesive Coated System
- Treatment Philosophy of the MBT™ Versatile+ Appliance System
Clarity™ SL and SmartClip™ SL3 Self-Ligating Brackets

Combining the Best of Clarity™ & SmartClip™ Brackets

Clarity™ Ceramic Bracket
- Leadership brand
- Ceramic technologies

SmartClip™ SL3 Bracket
- Unique self-ligating technology
- Fast growing self-ligating bracket

Aesthetics and Self-ligation, without Compromise.