SMARTCLIP™
SELF-LIGATING APPLIANCE SYSTEM
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CONCEPT AND BIOMECHANICS

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MOSBY
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It was four years ago when the notion of integrating MBT™ System principles and mechanics with self-ligating appliances was presented to the three of us (McLaughlin, Bennett and Trevisi). Two years earlier we had collectively published the defining text on the MBT™ philosophy of treatment, *Systemized Orthodontic Treatment Mechanics*. We had spent many years developing the appliance and the methods on a solid base of clinical evidence. Although we were (and are) committed to continuous improvement and an evolution of the appliance, we were cautious about folding this relatively new approach into our core philosophy. During this meeting in 2003, Dr Trevisi agreed to be our MBT™ system representative and was charged with the responsibility of understanding the intricacies and potential benefits of this new low-friction approach when coupled with the tenants of MBT™ system mechanics. During the past four years, Hugo worked in his clinic in Presidente Prudente, Brazil, and with the product development team in Monrovia, California toward that goal. This impressive text is a comprehensive presentation of his work and his successful integration of the MBT™ System approach with self-ligating mechanics. The results are excellent.

Richard P McLaughlin
At the beginning of the twentieth century, Edward Angle presented a new fixed orthodontic appliance: the Edgewise Appliance. This innovative device allowed tooth control in three dimensions: it controlled the angulation, inclination and rotation of teeth. Such an achievement was made possible due to the new features of this unique device – square brackets, a horizontal slot and brackets soldered to the buccal face of the metal bands. During its evolution this appliance received twin wings to allow better tying-in of the wires to the bracket slot, which led to improved three-dimensional control during tooth movement.

During the 1930s, 1940s, and 1950s, the Edgewise Appliance system was overwhelmingly successful as a result of the three-dimensional control of the teeth, although the ideal positioning of teeth was only obtained by inserting first, second, and third order bends in the orthodontic archwires. In the 1960s, new studies were conducted on tooth positioning using fixed appliances. The aim was to allow the brackets to control the three-dimensional movements of the teeth.

In the 1970s, Lawrence F Andrews introduced a new generation of orthodontic appliances with his Straight-Wire™ Appliance. The development of this appliance was built on an analysis of 120 non-orthodontic normal cases. The Straight-Wire™ Appliance had the same features as the Edgewise Appliance, such as square- and rectangular-shaped brackets and an .022/.028 slot size. However, some new features were introduced, such as angulation built into the mesial and distal wings, torque in the base, rotation for canines and second premolars in the base of the mesial and distal slot, and molar rotation obtained by adding metal to the distal end of the buccal tubes.

Again, in the 1990s, a new advancement in orthodontics took place with the development of rhomboidal-shaped twin bracket preadjusted appliances. In these brackets, the angulation imparted to the teeth was included in the bracket design.

By the end of the 1990s, based on their 20 years of experience working with preadjusted appliances, McLaughlin, Bennett and Trevisi introduced a range of improvements and specification changes to improve the three-dimensional control of teeth when working with preadjusted appliances. The authors proposed increasing the torque for upper incisors, decreasing the torque for the lower incisors, the use of three torque options for the canines, increasing the negative torque for the upper molars and reducing the negative torque from lower canines to second molars. All these improvements were based on sliding mechanics, applying light force levels, use of the .022/.028 slot size and .019/.025 archwires. All aspects of this treatment approach were published in 2001 in the textbook entitled *Systemized Orthodontic Treatment Mechanics*. These new improvements and specification changes were welcomed by clinicians worldwide.

By this time although fixed appliance had been used for orthodontic treatment for almost a century, and many improvements had been made, orthodontic appliances continued to be ligated appliances. Despite the medium-sized, twin edgewise bracket system having proved its reliability, it still has a disadvantage:
the friction caused by metal or elastic ligatures holding the archwire in the bracket slot during the three stages of the orthodontic treatment – aligning, leveling and space closure.

Considering all the issues mentioned above, a new design has been introduced for preadjusted appliances – an orthodontic appliance that continues to be a twin appliance system with rhomboidal shape and .022/.028 slot but is capable of decreasing the friction between the bracket slot and the archwire, and thus reducing the levels of applied force. This new appliance, called the SmartClip™ Self-Ligating Appliance, also has features as the previous existing appliances, providing easy handling for the professional and comfort for the patient.

While incorporating all the above mentioned features, the SmartClip™ Self-Ligating Appliance has as its basis the MBT™ Versatile+ Appliance System philosophy, which provides orthodontic treatment with low force levels when applying orthodontic mechanics. The general orthodontic principles described in Systemized Orthodontic Treatment Mechanics are extensively reviewed in this text to show how these concepts can be used with the SmartClip™ Self-Ligating Appliance. This appliance reduces the friction established between the archwire and the bracket slot, providing good three-dimensional control of the teeth, decreasing treatment time and, at the same time, allowing the clinician to provide excellent treatment results for patients.

Hugo Trevisi
Acknowledgments

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