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CONCEPTS AND FUNCTIONALITIES OF SELF-CONNECTING AND CONVENTIONAL BRACKETS: REVIEW OF CURRENT CONCEPTS

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RESUMO

Fabricantes e comercializadores de sistemas autoligáveis vêm investindo fortemente em marketing nos últimos anos para vender a ideia de maior eficiência desse sistema de tratamento em relação ao tratamento com sistemas convencionais. No entanto, apesar da crescente popularidade e excelente aceitação por usuários e ortodontistas, a opinião de que existe efetivamente uma superioridade clínica do sistema autoligado sobre o convencional ainda não é consensual na comunidade científica. Portanto, diante da diversidade de opiniões divergentes sobre o tema, o objetivo do presente estudo é realizar uma análise comparativa entre o sistema de tratamento com braquetes autoligáveis e os sistemas de tratamento com braquetes convencionais.

Palavras-chave: Ortodontia; Baquetes convencionais; Braquetes autoligados.

ABSTRACT

Manufacturers and traders of self-ligating systems have been investing heavily in marketing during the past few years to sell the idea of greater efficiency of this treatment system compared to treatment with conventional systems. However, despite the growing popularity and excellent acceptance by users and orthodontists, the opinion that there is effectively a clinical superiority of the self-ligating system over the conventional system is not yet consensual within the scientific community. Therefore, in view of the diversity of divergent opinions on this topic, the objective of the present study is to carry out a comparative analysis between the treatment system with self-ligating brackets and the treatment systems with conventional brackets.

Keyword: **Orthodontics; Conventional brackets; Self-connecting brackets.**

1. INTRODUCTION

Among the advantages of self-ligating systems over conventional systems, the lesser propensity to accumulate biofilm stands out, where in conventional systems that use elastomeric bandages the accumulation of biofilm is approximately 38% higher than in metal-made bandages. contraindicated the use of systems with elastomer components for patients with a history of poor oral hygiene habits (Martins, 2014; Fuso, 2017).

One of the points raised that must be taken into account is the elimination of elastomers and stainless steel bandages, evidencing its advantages, such as the eradication of cross contamination. Thus, patients in use with self-ligation systems have greater ease in maintaining good hygiene of dental surfaces and thus have less bacterial colonization and, consequently, less biofilm accumulation (Ferreira, 2019).

Some authors argue that both conventional and self-ligating brackets have a frictional force according to the dimensions of the arches. Above all, severe crowding can increase friction levels, thus making the self-bonding and conventional systems comparable to each other (Martins, 2014; Fuso, 2017).

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2. LITERATURE REVIEW

The history of dental medicine is related to several names, including Pierre Fauchard, who is considered the father of modern dentistry, this French dentist who developed his work in the first half of the 18th century is recognized for being one of the first specialists in orthodontics . Fauchard was the first to report a method of tooth movement, using a device that consisted of a perforated metal strip in the shape of a horseshoe, attached to badly positioned teeth and through fibers that made them move (Fuso, 2017). Over the thirteenth and nineteenth centuries, several mechanisms have emerged in order to correctly position teeth in the arches, during this period the main focus was on dental alignment and the correction of facial proportions, leaving the occlusal relationships neglected (Ferreira, 2019).

The first definition of occlusion arises with Edward H. Angle, in 1890, becoming a very important milestone in the development of Orthodontics. Angle's theory is based on the position of the first maxillary maxillary molars and their relationship with the maxillary first molars, considering a normal occlusion when the maxillary molar mesiovestibular cusp occludes in the buccal sulcus of the mandibular molar. Based on this principle, he described three classes of malocclusion: Class I, in which the molar ratio is normal, but the line of occlusion is altered due to poor dental positioning; Class II, the lower molar has a distal position in relation to the upper molar; and Class III, the mandibular molar presents a mesial position in relation to the maxillary molar (Proffit, 2013).

Based on the concept presented by Angle on occlusion, orthodontics developed in the 20th century is concerned not only with the alignment of teeth, but also with other aspects, including the relationship between the arches and the positioning of the teeth in relation to to its antagonist (Proffit, 2013). In 1910 Angle developed a device that used not only the bow, but other accessories such as bands, pins and tubes, which were parallel to the long axis of the tooth, believing that this mechanism allowed to control and distribute the forces in a physiological way, respecting the tissues periodontal. To this schematic he added, in 1916, an accessory that allowed the control of rotations, which consisted of an individual brace for each tooth, which had a block of molten metal, where the arch was attached, which he called a bracket (Fuso, 2017).

In 1928 Angle, he presented a new bracket that consisted of a rectangular box with three internal walls 0.022 inches high and 0.028 inches deep, with a horizontally open slot. of movement in the three planes, one of which being torque, thus creating the Edgwise system, which enabled tooth movement in all directions. This was certainly one of Angle's great contributions to the development of orthodontics (Fuso, 2017). In the mid-1980s, Andrews designed brackets with specific torques and angles for each tooth. This measure allowed a better adaptation of the individualized pieces with the anatomical characteristics of each tooth, thus eliminating the folds that were necessary to make in the arches in the Edgwise system, which compensated for changes in the contour of the tooth surface. With this, a more efficient version appears, the Straight-Wire device (Ferreira, 2019).

Stolzenberg developed in the United States in 1935, the first self-ligating bracket system, called Russel, which had a vestibular face that was open or closed, using an internal thread where a flattened horizontal screw fit, so that the wire was kept inside the bracket channel, without the need for metallic or elastic ties (Homem, 2015). In 1972 Wildman developed a bracket molded in chromium alloy, with a rounded shape being more resistant than stainless steel. This new system presented in the United States, called Edgelock, is considered the first passive auto-connectable bracket of orthodontics, as it had a sliding cover, which opened with a specific instrument, thus having a significant success in the market (Mariano, 2019). In 1975, the self-ligating Speed bracket was developed, the activation of this device occurs through the pressure of a flexible stainless steel spring, exerting force on the orthodontic wire (Fontana, 2019).

According to Oliveira (2017), self-ligating brackets are a contemporary reality, represented by a relative amount of aesthetic or metallic systems, characterized by clips, and active or passive closures. They present different designs and sequential protocols for the application of bows, according to each company or ma-

nufacturer. The main advantages of using these systems are: less friction and greater dental freedom during orthodontic mechanics; faster and more controlled movements, ease in changing the bows, less treatment time and better hygiene due to the absence of elastic bandages.

The conventional orthodontic treatment system is characterized by making use of elastic bandages to fix the arch to the bracket. It has the low cost as the main advantage in relation to the self-connected. The disadvantages are numerous, the use of elastomeric ligatures as a resource of union between arch and bracket represents a limitation of orthodontic biomechanics, due to friction. We can still cite as a disadvantage a greater propensity to accumulate biofilm, as it presents greater difficulty in cleaning, favoring the appearance of periodontal diseases, and should be avoided in patients with poor oral hygiene (Martins, 2014).

Efficiency can be defined as the relationship between the results obtained and the resources used, in order to obtain a certain desired result (Macedo, 2017). Currently, self-ligating brackets have been presented as a differential for the clinical orthodontist who seeks to deploy in an attempt to offer an excellent treatment in the shortest possible time and with minimal consultations (Martins, 2014). Self-ligating systems are described, by some authors, as being more efficient, as they represent a reduction in the number of consultations and in the total treatment time (Yang, 2017). Greater efficiency in orthodontic treatment means fewer visits to the dentist, shorter and less uncomfortable consultations, simpler techniques to apply for the professional, less need for extractions, greater comfort for the patient and reduced side effects, such as external apical resorption (Harradine, 2013).

Studies show that self-ligating is faster, requires fewer consultations and has better results. However, other studies do not verify differences in these parameters between the two systems, which suggests that there is still no scientific knowledge that supports the superiority of self-ligating with regard to the speed of treatment (Ferreira, 2019). The increasingly frequent use of sliding mechanics has made friction control in orthodontics one of the main concerns for the success of the treatment. Friction can be defined as a force that opposes or slows down the movement of two bodies that are in contact. In sliding mechanics, a high coefficient of friction will impair movement. Thus, the applied force should be sufficient to, in addition to moving the tooth, break the friction and enable movement. Thus, the lower the friction, the more efficient the movement will be (Martins, 2014).

There are two types of self-ligating brackets, active and passive. In the group of active brackets, the closing occurs through a clip that invades part of the channel and one of the walls. In the group of passive brackets, the bracket channel is closed by means of a lock that slides on the external surface of the fins, transforming all brsckets into tubes and creating four walls in the channels, rigid and passive. The friction in passive brackets is relatively less, since the clip that holds the wire in the bracket does not have as much contact with the wire as occurs in active type brackets and above all in conventional brackets, in the case of conventional brackets the frictional force becomes even stronger due to the elastomeric components that are needed to attach the orthodontic arch to the bracket (Pergher, 2017).

One of the biggest advantages highlighted by the use of the self-connected device is the use of friction force. The frictional force is considered one of the biggest problems for the control of forces and movement for the orthodontist, because the greater the friction, the lower the effectiveness of the mechanics, which reduces the speed of tooth movement and makes it difficult to control the anchorage (Pergher, 2017).

3. CONCLUSÕES

In general, self-ligating brackets have characteristics that overlap with conventional ones by eliminating elastic modules, which provides them with some advantages over the conventional system such as: elimination of the potential for cross-contamination, which occurs through the contact of one elastic with another, non-existence the degradation of elastic forces, less accumulation of food residues around the retentive sites, which reduces the formation of biofilm, as well as reducing the risk of enamel demineralization and the appearance of white lesions in the bracket region. The possible reduction of friction in this mechanics and the lower application of force have positive effects.

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