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ORIGINAL RESEARCH

Bacterial load assessment in metallic versus esthetic brackets

Evaluación de carga bacteriana en brackets metálicos versus *brackets cerámicos*

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ABSTRACT

Objective: To assess the bacterial load in metallic and ceramic brackets and determine which favor dental plaque retention. **Material and methods:** Extracted premolars divided into 2 groups and analyzed. In one group metal brackets were placed and in the other group, ceramic brackets. **Results:** Statistical analysis were performed and it was determined that there was no significant difference. **Conclusion:** The type of bracket used in the orthodontic treatment, is not a determining factor in bacteria adhesion and therefore plaque accumulation as long as proper hygiene is maintained.

RESUMEN

Objetivo: Evaluar la carga bacteriana en brackets metálicos y cerámicos para determinar cuáles favorecen la retención de placa dentobacteriana. **Material y métodos:** Se analizaron premolares extraídos, divididos en dos grupos, uno cementados con brackets metálicos y en el otro con brackets cerámicos. **Resultados:** El análisis estadístico se realizó en el software Minitab, realizando una prueba t de Student en donde se determinó que no había diferencia significativa entre grupos (0.204). **Conclusión:** El tipo de bracket utilizado en el tratamiento de ortodoncia no es un factor determinante en la adhesión de las bacterias, y por tanto la acumulación de placa dependerá de si existe o no una higiene adecuada.

Key words: Ceramic brackets, metallic brackets, colony-forming unit (UFC), bacterial load.
Palabras clave: Brackets cerámicos, brackets metálicos, unidades formadoras de colonias (UFC), carga bacteriana.

INTRODUCTION

Dental plaque is an heterogenous accumulation of a diverse microbial community both aerobic and anaerobic; surrounded by an extracellular matrix of polymers, microorgansims and saliva.[1] After a dental cleaning, the dental enamel is covered by a variety of proteins and glyxoproteins. This lining is called acquired pellicle (biofilm) and the first colonizers are streptocci followed by lactobacillus that are commonly found over dental surfaces.

This biofilm is mainly formed by non-patogenic bacteria however due to the ingestion of sucrose and other carbohydrates, fermenting acids are produced. This leads to enamel demineralization and eventually, caries. Among the most important microorganisms are: *Porphyromonas gingivalis*, *Bacteroides forsythus*, *Actynomices actinomycetemcomitans* and *Treponema denticola*.[2-5]

For a long time, orthodontic patients were considered to be low-risk and the procedures involved in their treatment, non-invasive. However, the appliances used for orthodontic treatment may be associated with oral hygiene difficulty.[6-8] During treatment remnant areas which stimulate biofilm production and bacterial growth are created. One of the biggest challenges in orthodontics is to maintain an adequate oral hygiene throughout treatment. The tooth area that surrounds the brackets favors bacteria adhesion and dental plaque formation. These are difficult to eliminate and regular brushing is not sufficient for removing them in retentive zones such as the one formed by the adhesive between the bracket and the gingiva.[9-12] The more common complications in orthodontic treatment due to plaque accumulation are caries and periodontal disease.[13-16]

The fixed passive orthodontic components are brackets which serve as support for the components

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that produce the force. Ceramic brackets are very popular as an aesthetic alternative for orthodontic appliances in contemporary orthodontics. Ceramics are a broad type of materials that consist of metallic and non-metallic oxides which include gemstones, glasses, clays and ceramic mixtures.[17,18] Metal brackets are mainly made of high-quality stainless steel; they have good bond strength and have proved to be more resilient than ceramic brackets due to their composition.[6]

MATERIAL AND METHODS

Sample obtention

Twenty first premolars that had been previously removed were analyzed. They were divided into 2 groups (n = 10). Group 1 contained premolars with metal brackets bonded on them, while in group 2 ceramic brackets were bonded on the premolars *(Figure 1)*.

Disinfection protocol

The disinfection protocol used was an ultrasonic bath. Each group was plunged into a 500 mL beaker. Two solutions were used for disinfection, first 17% EDTA for 10 minutes to remove the organic and inorganic matter. Subsequently, 5.25% sodium hypochlorite was used for the same amount of time in order to remove the organic matter. Between both baths, the premolars are flushed with sterile distilled water.[19] Finally sample sterilization was carried with an autoclave at 121 °C and 15 psi. Afterwards, the supports were cemented in the corresponding groups, Group 1: metal brackets (Ah-Kim-Pech®) and Group 2: ceramic brackets (3M Clarity®) in a laminar flow cabinet to maintain the sterility of the sample. To corroborate the sterilization process, a microbiological sample was taken from each dental component (20 in total). Using a 10 μL micropipette sterile distilled water was deposited on the upper part of the bracket. On the distilled water side, three sterile # 45 paper tips (Hygienic®) were placed, each for 1 minute. The first two were placed in the middle and the last was swept from one side to another. The paper points were then deposited in a test tube with 10 mL of trypticase soy agar as means of transport *(Figure 1)*. The result of the sample was negative, assessed with the McFarland scale; the sample was planted in trypticase soy agar plates where there was no microbial growth.

Sampling and incubation

The samples were taken from a patient who was under orthodontic treatment by using 3 sterile paper points with the method described above. They were deposited in a test tube with 10 mL of trypticase soy agar and incubated for 24 hours. A microbial growth with a McFarland standard of 7 was obtained; then a 0.5 McFarland standard is corresponded since this turbidity is typically found in the oral cavity. Subsequently, each tooth was placed in a test tube with 10 ml of trypticase soy agar and 5 drops of the sample with bacterial growth (0.5 McFarland). Every 48 hours, the Tryiticase Soy broth of each sample was changed during 10 days with the purpose of obtaining the second sample and keeping the bacteria alive. The second sample was obtained in the same manner as the first; each one was placed in 10 mL of trypticase soy agar. After two hours of bacterial growth, serial dilutions were carried out between 10-1 and 10-3 in each sample. Once diluted, the sample was planted in an agar plate containing trypticase soy agar, labelled and sealed with parafilm. Afterwards, it was placed in a Felisa incubator for 24 hours at a temperature of 35 ± 2 °C. Then, the CFU (Colony Forming Units) count was performed. A colony counter digital pen was used. Only samples with values between 30 and 300 CFU were taken into consideration *(Figure 2)*.[20]

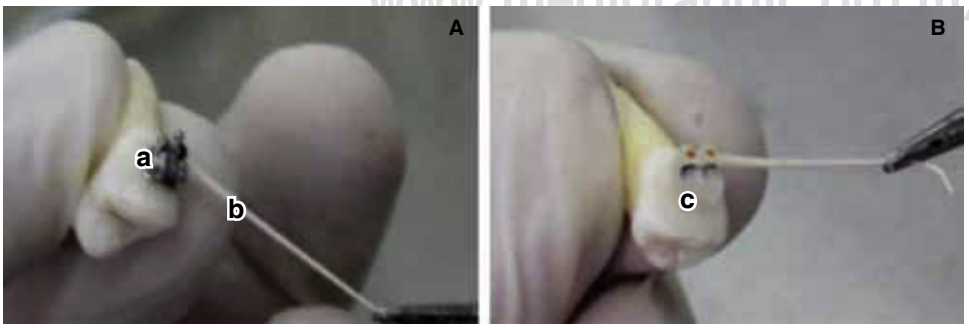

Figure 1.

Sample collecting with sterile paper points. **A.** Group A, a. metallic bracket, b. paper point; **B.** Group B, c. ceramic bracket.