

Effects of Orthodontic Forces, Produced By Active And Passive Self-Ligating Brackets, On The Root Cement

Assoc.Prof. Dr. Norehan Mokhtar ¹, Mohammed Kadhim Al-koofee ²,

¹Craniofacial and Biomaterial Science Cluster, Advanced Medical and Dental Institute, Universiti Sains Malaysia, Bertam, 13200, Kepala Batas, Penang, Malaysia

²PhD candidate in Craniofacial and Biomaterial Science Cluster, Advanced Medical and Dental Institute, Universiti Sains Malaysia, Bertam, 13200, Kepala Batas, Penang, Malaysia.

norehanmokhtar@usm.my ¹, mujtabaalkufi.1984@gmail.com ²

ABSTRACT

Background: The objective of this work, of an experimental clinical nature, was to observe in vitro, through the utilization of different types of microscopes and of the study micro-analytical, possible structural and chemical changes of root cement, produced by the effect of orthodontic forces generated when using braces active and passive self-ligating, after the period of alignment, leveling and expression initial torque of orthodontic treatment.

Materials and methods: the study was carried out on a sample of 20 first premolars upper, 10 right and 10 left, extracted for orthodontic reasons, after informed consent, from 10 young patients 13 to 18 years of age (3 men and 7 women), which presented complete permanent dentition, with a discrepancy osseo-dental less than 5 millimeters, and with dental extraction orthodontic ally indicated for make up for the discrepancy skeletal or dental sagittal of class II existing. Everyone patients received orthodontic treatment with active self -ligating braces and Passives in shape simultaneous. The braces self-ligating assets were cemented in the hemiarcsades right, While than the braces self-ligating Passives, in the hemiarcsades left. The variables analyzed microscopically in the first premolars superior rights and left were: Area, volume and depth, to level of the zones of reabsorption of the tissue cement, how So too, the changes in the composition chemistry (content mineral to through of microscopy electronics analytics) in the zones of reabsorption and periphery of them.

Results: Although structural and chemical changes were observed in the root cement, There were no significant differences when using active or passive self-ligating brackets. Neither there were marked differences between the samples from different patients. The size of the craters in the root resorption zone, in area, volume and depth was very similar for both types of braces. On the other hand, when studying chemical changes, through microanalysis of the tissue, I know they identified variations relative similar in both of them groups of samples first premolars superior rights and left, submitted to braces self-ligating assets and liabilities respectively.

Conclusions: There are no significant differences in the biological response (structural and micro-analytical) of the dental cement, among the different samples analyzed from of different patients, when using active or passive self-ligating brackets.

Key Words: Brackets, Forces, Cement, Resorption.

INTRODUCTION

Effects Of Orthodontic Forces Produced By Self-ligating Brackets Assets And Liabilities On The Root Cement. In the study of orthodontics it is of fundamental importance the knowledge of the phenomena that take place in the tooth and neighboring tissues, as a consequence of the application of forces exerted by the different orthodontic appliances. The operator should have criteria to select orthodontic appliances that act respecting the biological limits of periodontal and dental tissues. The periodontal tissues form the organ of support and protection of the dental element. According to its function, the periodontium is divided into protective periodontium and periodontium insertion. The latter is presented as a functional unit, made up of the root cement, the periodontal ligament and the alveolar bone (Gómez de Ferraris,2009). As a component of the insertion periodontium, the root cement has the function main anchor the fibers of the periodontal ligament to the root of the tooth. One of the sequels than cobra every time higher importance and than I know Watch habitually in the patients submitted to orthodontic treatment, is root resorption external, understood it is like the morphological and chemical alteration of the root cement (Brezniak and Wasserstein,1993). Root resorption in the primary dentition is a physiological process derived from the forces generated by the eruption of permanent teeth and by the presence of a potential for resorption inherent in the structure of primary teeth. By on the contrary, root resorption in permanent dentition is never physiological Orthodontics uses the inflammatory process as a means of solving problems functional and aesthetic, which sometimes induces an adverse phenomenon of reabsorption external root canal called "orthodontically induced inflammatory root resorption" (RRIIO), he than may be observed radiographically but without estimate its depth neither extension in the surface root (Alexander et al.,2009). To avoid these adverse effects we must use orthodontic appliances that exert an ideal force while respecting the physiology of the insertional periodontium (Ballard et al.,2009).

MATERIALS AND METHODS

Effects Of Orthodontic Forces Produced By Self-ligating Brackets Assets And Liabilities On The Root Cement. In the present investigation, a clinical trial was carried out, with prior consent informed, informed consent. The patients had complete permanent dentition, with a discrepancy osseous-dental less than 5 millimeters and indicated orthodontic extraction (first premolars higher) for make up for the discrepancy skeletal or dental sagittal of class II existing.

The Discrepancy osseo-dental minor to 5 millimeters allowed to include in the appliances to the first premolars superior (elements than were analyzed) without alteration of bone support.

Clinical Cases

Below are the clinical cases with their respective diagnoses, as well as also the sequence of arches used until the moment of extraction of the samples (first premolars superior rights and left). Consecutively to depart of the page 125 reveals how these samples were obtained, stored, and analyzed.

Hard Tissue Analysis



Figure 1: When analyzing the image obtained in the orthopantomography, we can find, as relevant data, the presence of the third molars (18,28,38 and 48) in the process of eruption and the absence of root resorption prior to orthodontic treatment.



Figure 2: On the lateral teleradiography, the Cephalometric Analysis of Ricketts, Jarabak and Mc Namara, who will be described below.

Analysis of Intra-oral Photographs and Models Mounted on Articulator



Figure 3: Intraoral images taken in the position of maximum intercuspation. Analysis of malocclusion in the three senses of space and dental bone visual discrepancy (DVOD). a) Vertical: Presents overbite b) Transversal: No lateral cross bite c) Sagittal: Class II molar and canine bilateral relationship an augmented curve of Spee. d) DVOD: Upper -3mm and Lower -1mm.



Figure 4: Images of models mounted in centric relation. Analysis of malocclusion in the three senses of Effects of Orthodontic Forces Produced by Self-ligating Brackets Assets And Liabilities On The Root Cement. dental bone space and visual discrepancy. When repositioning the lower jaw in centric relation, it was observed a mandibular recession with increased expression of the existing class II.

Arches Sequence

Effects of Orthodontic Forces Produced by Self-ligating Brackets Assets And Liabilities On The Root Cement. The images show the sequence of arches used until the moment of making tooth extraction and collection of samples (upper right first premolars and left).

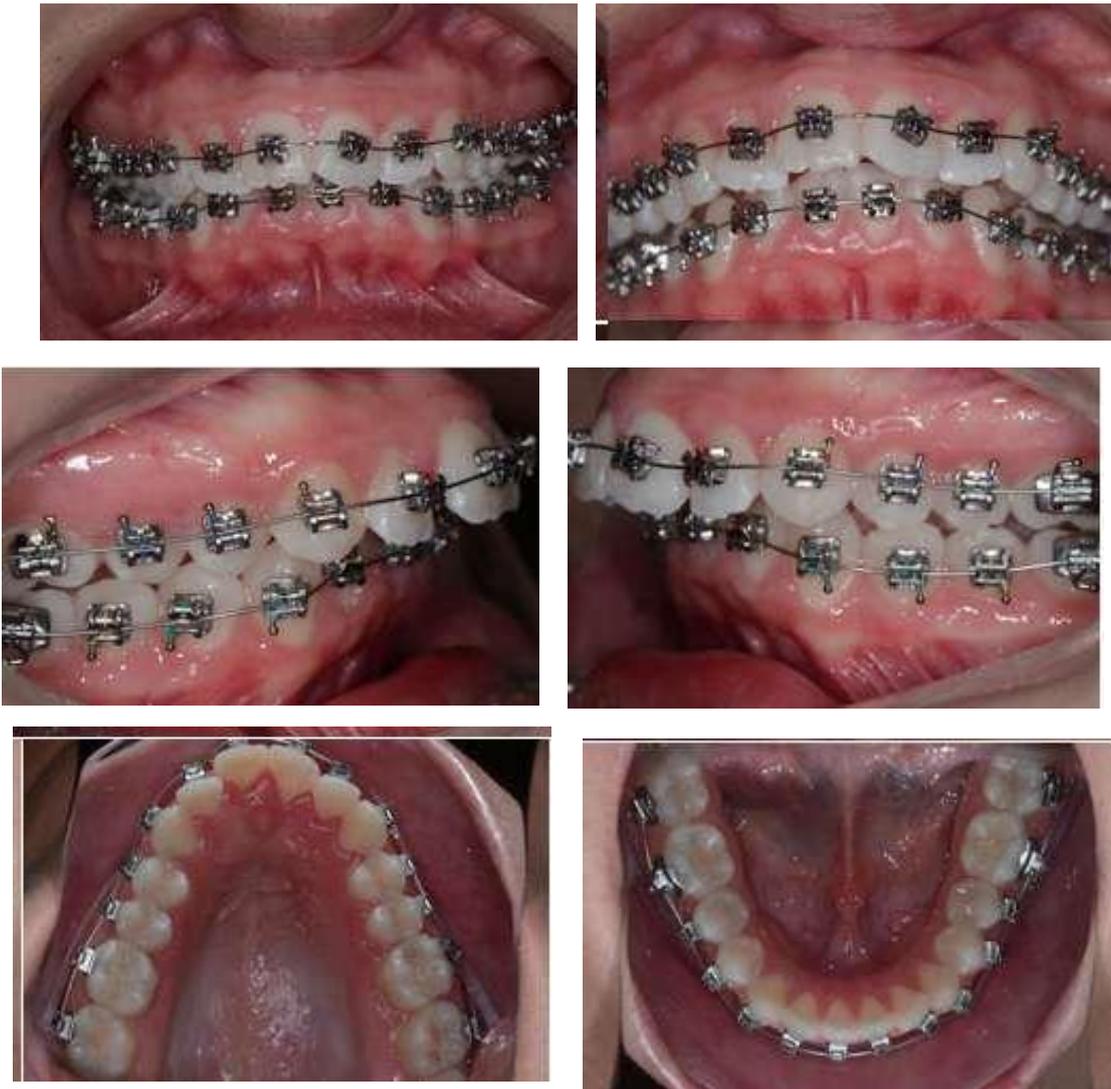


Figure 5: Positioning of 0.014 inch A-NiiTi archwires in both arches (upper and lower). Hemiarch-The right ones with active self-ligating brackets and the left hemiarcs with passive self-ligating brackets.

RESULTS

Effects Of Orthodontic Forces Produced By Self-ligating Brackets Assets And Liabilities On The Root Cement. In this work, of an experimental clinical nature, it was observed in vitro by using different types of microscopes and micro-analytical study, structural changes and root cement chemicals, produced by the effect of orthodontic forces generated when using active and passive self-ligating brackets, after the alignment period, leveling and initial expression of treatment torque orthodontic. In the objectives set out in this research, we only had to investigate the possible existence of reabsorption areas in the root cement when using brackets self-ligating assets and liabilities, but also to compare them by measuring and observing the changes structural in these areas. With this criterion, the first premolars superior rights (element dental 14) and left (element dental 24) undergoing orthodontic treatment with active self-

ligating brackets and Passives respectively. I know they analyzed comparatively the total of twenty samples, corresponding to the experimental and control group.

Images Obtained With A Confocal Microscope Of The Samples Obtained

The root topography of the samples (first premolars upper right and left) obtained from the patients who participated in this investigation. These images illustrate the reabsorption zones generated in the different faces and root thirds of the same after the initial expression of the root torque.

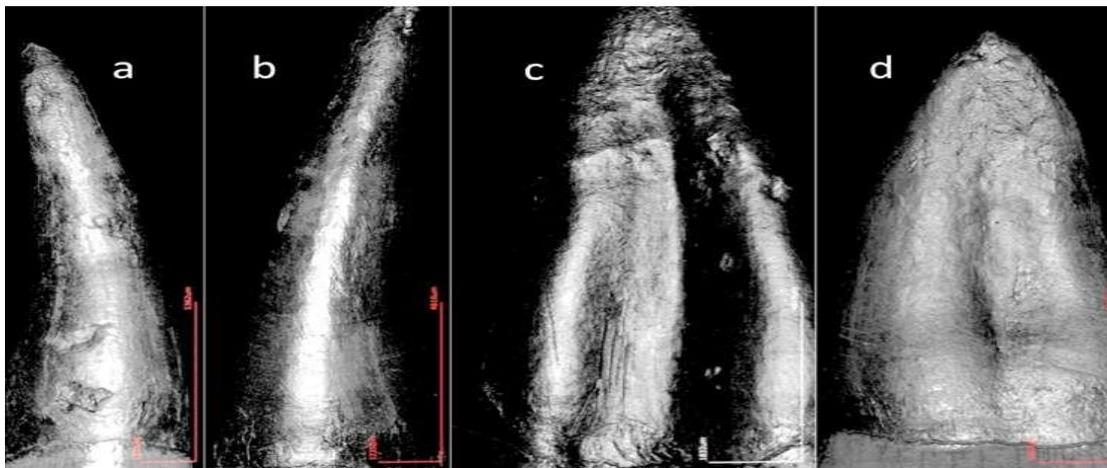


Figure 6: Element 14 The images obtained in this study are observed with confocal microscopy. Are appreciated crater-like root resorption areas a) Vestibular face, b) Palatal face, c) Mesial face, d) Distal face.

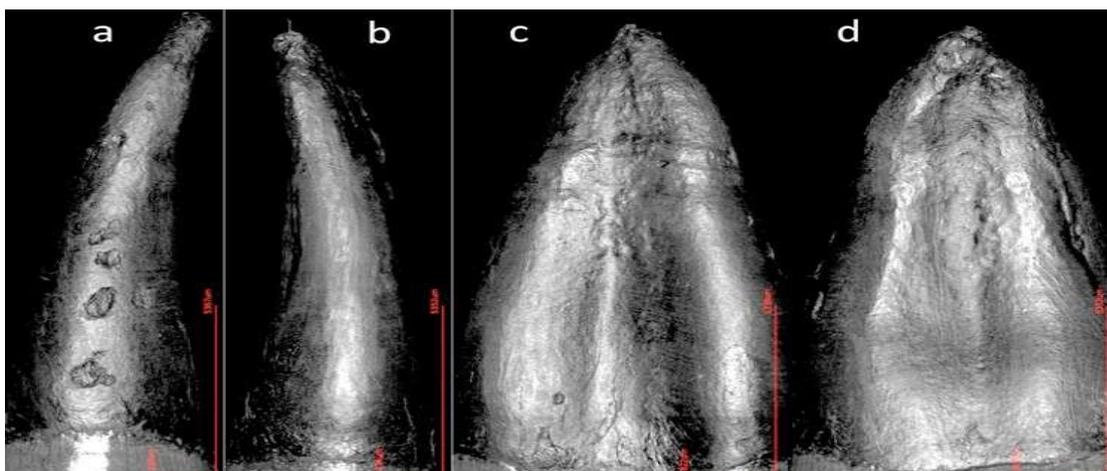


Figure 7: Element 24 The images obtained in this study are observed with confocal microscopy. Are appreciated Crater-like root resorption areas: a) Vestibular face, b) Palatal face, c) Mesial face, d) Distal face.

Measurements Made With The Microscope Software Confocal (Olympus Lext 3d).

Effects Of Orthodontic Forces Produced By Self-ligating Brackets Assets And Liabilities On Root Cement. With the confocal microscope the area (including width and length), depth and volume of the reabsorption zones. In the 10 samples belonging to the first right upper premolars (item 14), which were subjected to self-ligating brackets assets, I know they observed 85 Zones of reabsorption, by the than was necessary perform a total of 425 measurements, while in the 10 samples belonging left upper first premolars (item 24), which were subjected to passive self-ligating brackets, 83 reabsorption areas were observed, so it was A total of 415 measurements are required. In turn, each measurement was performed 10 times to estimate its standard error.

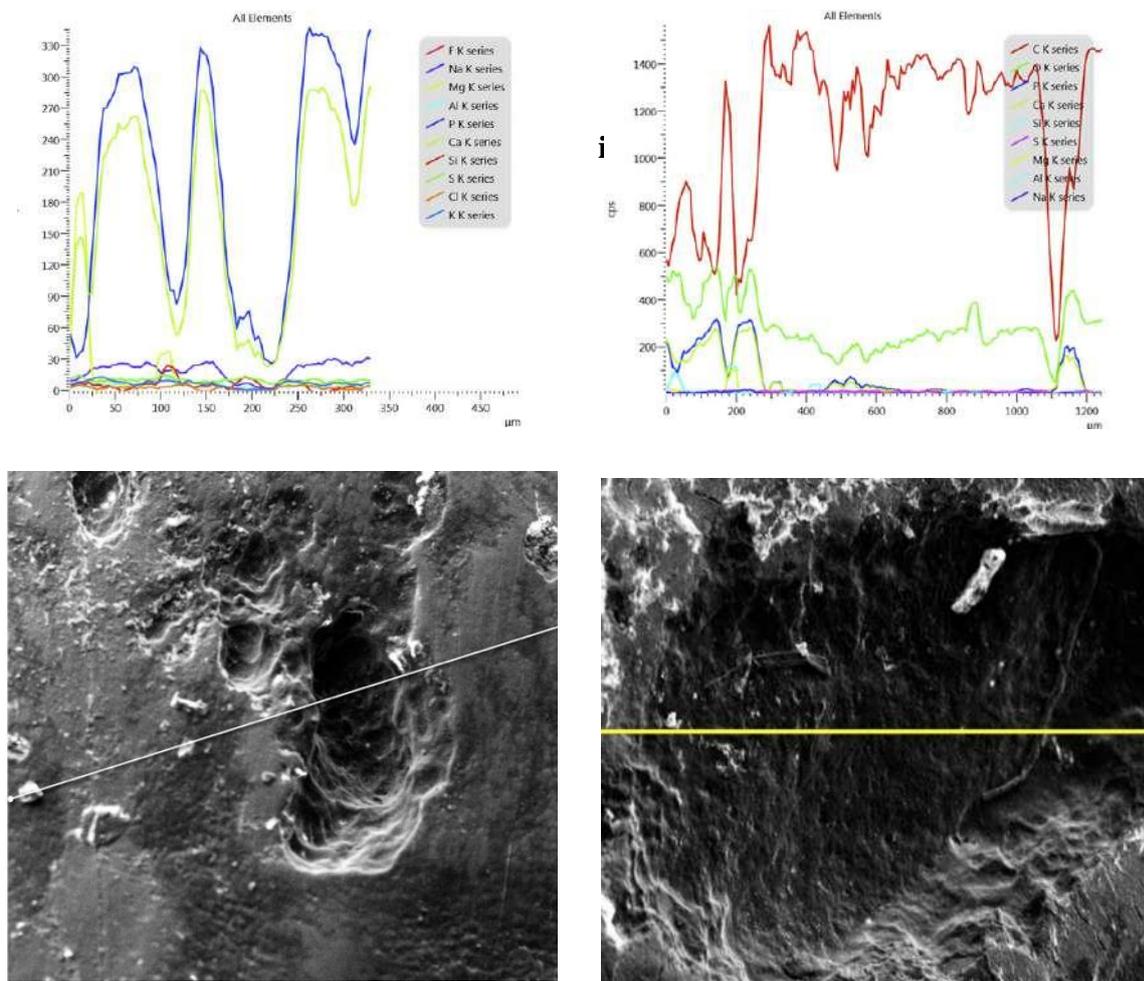


Figure 8: ScanLine performed in areas of resorption of elements 14 and 24 (upper right first premolars and left) of patient number 1. Taken at LAMARX FAMA.F.UNC

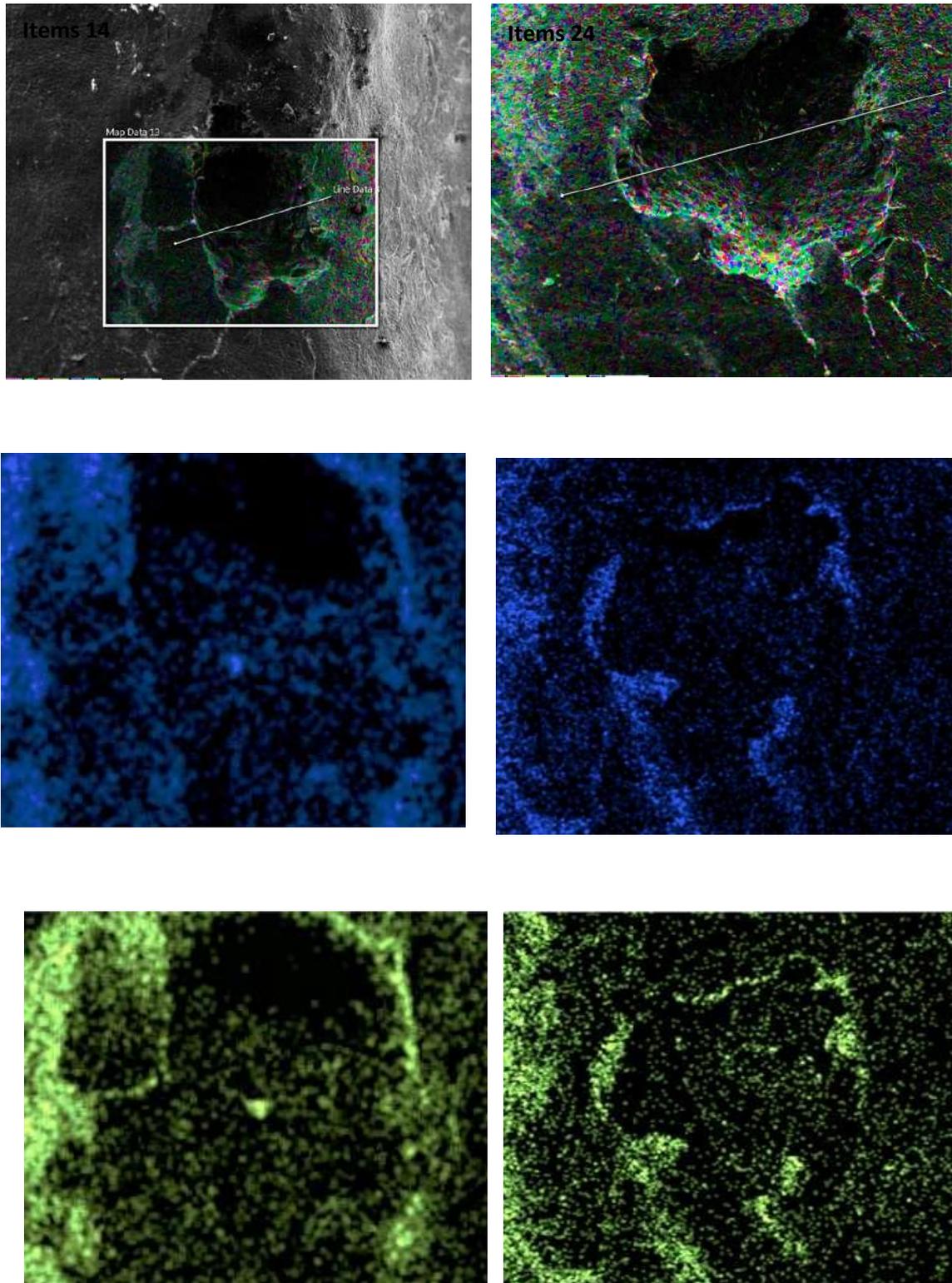


Figure 9: Mapping performed in areas of reabsorption of elements 14 and 24 (upper right first premolars and left) of patient number 1. Taken at LAMARX FAMAF.UNC.

DISCUSSION

Effects Of Orthodontic Forces Produced By Self-ligating Brackets Assets And Liabilities On The Root Cement. In this study, an investigation was carried out to determine the degree of root resorption in upper first premolars of class II patients treated with self-ligating brackets assets and liabilities simultaneously and the results obtained were compared. In the data analyzed no existed differences significant to the use braces self-ligating assets or Passives, with a sequence standard of bows TO NiTi, for achieve a reply different in the preservation of the cement root. Both of them generate "Reabsorption root inflammatory induced orthodontically " (RRIIO), with lost of tissue (cement and dentine) of the tooth root. The size of the reabsorption zone in area, volume and depth was very similar for both types of brackets. These results coincide with those obtained by others authors in previous studies that compare the degree of root resorption present then of use braces conventional and self-ligating Passives prescription Damon. Of the studies reviewed, only this research contrasts the effect of the forces produced by the clips of the active and passive self-ligating brackets on the root cement. For assess the degree of root resorption instruments can be used diagnostic In Vivo, such as radiographic studies (Barbagallo et al.,2008; Pandis et al.,2008) and Conebean Tomographic. Although we can affirm that these lack precision since they only manifest images when there is a significant loss of dental material. Also, with these methods, it is not feasible to determine whether the resorption affected the dentin tissue, a fact of great importance in determining whether or not the reabsorption zones could be repaired. Is for this reason, in this research we chose to carry out an In Vitro study using a tooth with extraction indicated to perform a better analysis of the areas of root resorption generated by active and passive self-ligating brackets. Confocal Microscopy was used to observe the topography of the reabsorption areas and the Scanning Electron Microscope (SEM) with the EDAX probe, to observe the chemical and structural changes in the reabsorption zones. The SEM could also be used, as some authors did , for observe the topography of the reabsorption areas, with stereo photographs of the areas reabsorption, but it is complex to obtain accurate results. The Confocal Microscope used in this work or the Micro Computed Tomography used by other researchers, allow to obtain, from a clear and simple way, three-dimensional images of the root resorption areas, in order to be able to assess the area, volume and depth of the same. Valuation of the depth of the reabsorption areas are very useful, to estimate if resorption affected dentin tissue or not. The Confocal Microscope and the Micro Tc Scan are more effective than the Electron Microscope Scanning to perform a volumetric analysis of the root resorption craters. At present there are no other

research works available in the bibliography. What use he Microscope Confocal or Micro TC Scan for compare he effect of the forces produced by braces self-ligating assets and Passives On he cement root. The chemical changes of the reabsorption areas were observed through a microanalysis, where similar relative variations were observed in the composition chemistry of both groups of samples, upper right first premolars and left, subjected to active and passive self-ligating brackets respectively. East result coincides with those obtained in other studies Effects Of Orthodontic Forces Produced By Self-ligating Brackets Assets And Liabilities On Root Cement. in which they were analyzed respectively, the chemical composition of the cement and the alterations in it after applying mild and strong orthodontic forces. The great marketing strategy of passive self-ligating brackets was always the possibility of generating more physiological forces compared to self-ligating brackets assets, for preserve the periodontium biology of insertion (Rex et al.,2005; Rex, and Darendeliler,2006). However the analysis carried out of all the variables studied in this research determined, that the effect that both types of brackets (active and passive self-ligating) produce level of the cementum or periodontal support of the dental element is similar, since although There were topographic, biological and chemical changes, they were not significant in the comparative study; data that until now had not been investigated. The reabsorption zones at the root level found in this work mostly affect to the dentin tissue, making it difficult to repair as they support it some authors (Damon et al.,2006). The results found allow us to assert that it is indistinct to use brackets Active or passive self-ligating agents in order to preserve the biology of the periodontium insertion.

CONCLUSION

The degree of root resorption generated by orthodontic appliances does not depend of the kind of bracket self-ligating used (active or passive). By the what no there would be differences between using one or another type of bracket. The area and / or volume of resorption present in the different root thirds does not it depends on the type of self-ligating bracket used. Although there were differences, they were not significant. In all the extracted premolars, areas of resorption were found that reached to dentin, which leads to irreparable loss of cementum-dentin tissue. Without However, no replacement type reabsorption was found. In the microanalysis of the samples from both experimental groups, if well there were differences were not significant. It has been shown in clinical and biological evidence that root resorption of the third apical does not depend on the type of self-ligating bracket used. So it is suggested

to use the minimum of forces orthodontic, compatible and acceptable physiologically with both appliances, to try to prevent or minimize cementum-dentin resorption.

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