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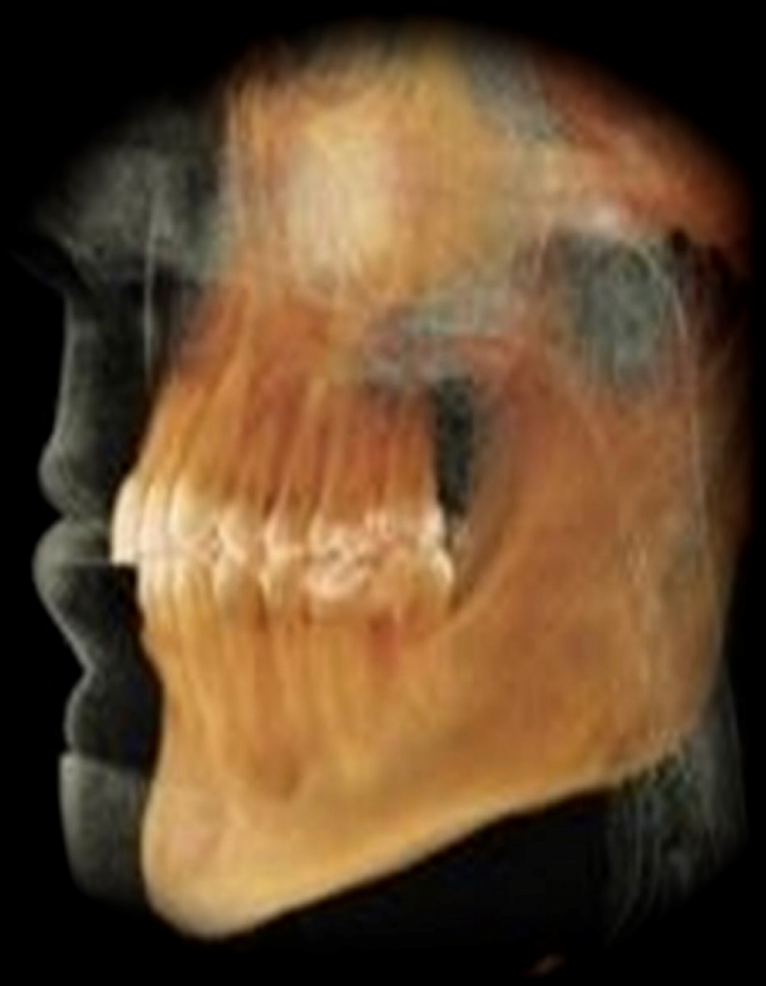

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Editorial

Dear Researcher,

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Mário dos Anjos Neto Filho
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Summary

ORIGINAL ARTICLE

CASE REPORT

IN VIVO ACCURACY AND RELIABILITY OF A NEW APEX LOCATOR IN LOCALIZE THE APICAL FORAMEN

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ABSTRACT

The objective of this study was evaluated in vivo accuracy and reliability to identify the apical foramen by Quill® Apex Locator. Patients with indication for extraction by orthodontic and periodontal reasons were selected, which resulted in a sample of 21 root canals. Performed the cavity access, the cervical and middle parts of the root canal were prepared and proceeded up the readings at the corresponding point on the display device up to the apical foramen. After that the file was fixed and the tooth extraction was performed. Subsequently we performed a wear on one wall of the apical region, aiming to visualize the tip of the instrument and the continuity up to the apical foramen. The distance between the file tip and the apical ending foramen (FA-I) was measured with the SEM, and were assigned positive values for the instruments that were beyond the apical foramen and negative to the instruments that were before the apical foramen. The sample data showed a mean 0.116 mm (± 0.307 mm) for the variable I-FA, it was close to the apical foramen (zero point). The values did not show any data discrepancy but a certain balance between positive and negative values, with the highest concentration of data in the range of -0.3 to 0.3 mm. In accordance with the t test ($p = 0.097$) it was concluded that there was no significant evidence to reject the average of I-AF is equal to zero (apical foramen). The study demonstrated that the device Quill® was accurate and reliable to identify the apical foramen.

KEYWORDS: Endodontics, odontometry, equipment and supplies.

1. INTRODUCTION

The evolution of endodontic knowledge had its beginnings when it was consolidated that bacteria play a key role as an etiological factor of pulp and periapical changes. Since then, the aim of endodontic treatment became the incessant search for decontamination of the root canal system and its consequent sanitation for later fillings[1].

For the success of these procedures, however, the correct determination of apical limits of endodontic treatment reverses are of particular importance, as evidenced by in vivo studies, in which the most favorable histologic conditions were found when the shutter remained short or apical constriction[2]. Thus, the apical constriction has been recommended as an ideal limit to the working length, since it corresponds to the narrowest portion of the root canal diameter.

Through the decades, various methods have been proposed in order to determine the end of root canals, including mathematicians, radiographic and electronic methods[3].

The radiographic method, when properly executed, can be considered accurate and reliable. However, it is virtually impossible to get X-rays without distortion. The measures highlighted the tip of the instrument to the radiographic vertex are usually larger than the real, which can lead to malpractice. Moreover, the radiographic image provides a two-dimensional view of a three dimensional object, it is often difficult to interpret due to the overlapping anatomical structures[4,5]. Therefore, the search of greater reliability and accuracy in determining the working length appeared to electronic techniques, constant targets of studies and advances in endodontics.

The apical locators, now more properly called electronic locators foraminal, have been proposed and developed nearly a century ago, but only from the 50s began to be employed[6]. However, the reliability of this generation apparatus was not contemplated, especially in channels containing moisture. Other generations of handsets have been launched for decades, but, without satisfactory results on the accuracy and reliability of the

electronic method in evaluating in vitro or in vivo, problem is always linked to moisture in the root canal.

The previously described problem was solved when a variation of the electronic measurement method of root canals from the determination of the electrical resistance values as a function of two alternating current frequencies was demonstrated, which enabled the reading under humid conditions inside the root canal. From this, many locators were manufactured and the accuracy and reliability of each of these devices have been studied in depth, obtaining excellent results[7,8].

Although the locators indicates the distance between the tip of the file and the apical foramen, the most reliable measure happens when the tip of the file is located on the apical foramen, i.e., the browser reads the apical foramen. Clinically locators when used in reading the apical foramen, as well as better precision, gives the actual length of the tooth and by subtracting this measure is to allow the operator to set the working length below 0.5 mm or 1 mm to ensure that all endodontic treatment phases are limited to root canal [9].

Many studies have shown good results with the use of electronic odontometry, revealing that accurate measurements are obtained with various types of locators foraminal currently[10-12]. However, with the emergence of new devices in the dental market, it is important that further research be conducted, particularly in methodologies to assess the functioning of these devices *in vivo* in order to check and compare the efficiency in measuring the root canal accurately and reliably.

2. MATERIAL AND METHODS

This study, in vivo, held odontometry readings in 21 human teeth (04 maxillary central incisors, upper lateral incisors 03, 01 lower central incisor, lateral incisor 01, 05 upper canines, canine lower 01, 01 first premolar, 02 upper second premolars, 02 lower first premolars, 01 seconds premolar), with prior indication of extraction for orthodontic or periodontal reasons. Patients were submitted to anamnesis and clinical examination by a trained operator for the experiment. The study was approved by the Ethics Committee of the participating institution (CAAE: 07102412.5.0000.0021). Initial radiographic examinations were performed in order to detect situations that would throttle the experiment. The apparent length of the tooth was measured on the radiograph using a millimeter ruler endodontic, and obtaining the length of interim work.

After antisepsis of the operative field, the teeth were anesthetized by infiltration of local anesthetic articaine 4% with epinephrine 1: 100,000 (DFL®, Brazil). The teeth were absolute isolation, and any metal restore this removed during coronary opening procedure in order to avoid interference in the readings of the electronic finder.

After the location of the channel entrance, the initial catheterization K file 10 or 15 (Dentsply Maillefer®, Switzerland) was performed, to approximately 4 mm below the provisional working length established by measuring the tooth length in the original image radiography. Abundant irrigation of sodium hypochlorite solution at 2.5% was made the pulp cavity during this procedure. In all cases, prior to the measurement electronics, the preparation was carried out of the cervical and middle thirds with drills Gates Glidden figures 2 and 3 (Dentsply Maillefer®, Switzerland) and the root canal at the mouth end enlargement was done with the drill CPdrill (Helsen®, Brazil).

Aiming to exploring the path again initially recognized, the instruments were positioned again for 4 mm exploratory provisional length. In cases of dead or necrotic pulp, the excess bleeding or sodium hypochlorite at the level of the pulp chamber was drawn into the realization of the measure.

In order to measure electronically, a file type K (Dentsply Maillefer®, Switzerland) that best adjust to the anatomical diameter of the root canal was introduced toward the apex until the green light to stay lit, as described below sequence (modus operandi according to the manufacturer):

- Insert the tool into the root canal, making sure that it fits the walls of the canal to the provisional working length;
- Turn on the apparatus;
- Connect the electrode (colgante pole) in the corner of the mouth of the patient;
- Connect the other electrode to file (lime port);
- The instrument should be introduced apical turning it gently clockwise or oscillatory movements. As the file approaching the foramen, the device LEDs will be illuminated by the green light and remain stable, which means that it has reached the apical foramen "position FO" (foraminal output).

When the file get to the point "0.0" (green light), it was fixed with cyanoacrylate (Henkel®, Brazil) and light-cured composite resin (Evolu-x Dentsply®, Brazil) was inserted around the file to fill all crown opening.

In sequence, the total isolation was removed and the tooth extracted as the surgical technique indicated. The obtained teeth were cleaned with sodium hypochlorite at 2.5% for 10 minutes and stored in saline solution.

Before subjecting the sample measurements, the same were prepared as described below. The output of the apical foramen was visually identified by inserting the tip of a K file 08 or 10 (Dentsply Maillefer®, Switzerland) on its external portion, towards apex/ Crown only to facilitate its location. This maneuver aimed properly choose which face could be worn. The last 4 mm dentin wall of the outer faces of the root were gently removed by wear with carborundum disk (Komet®, Bra-

zil).

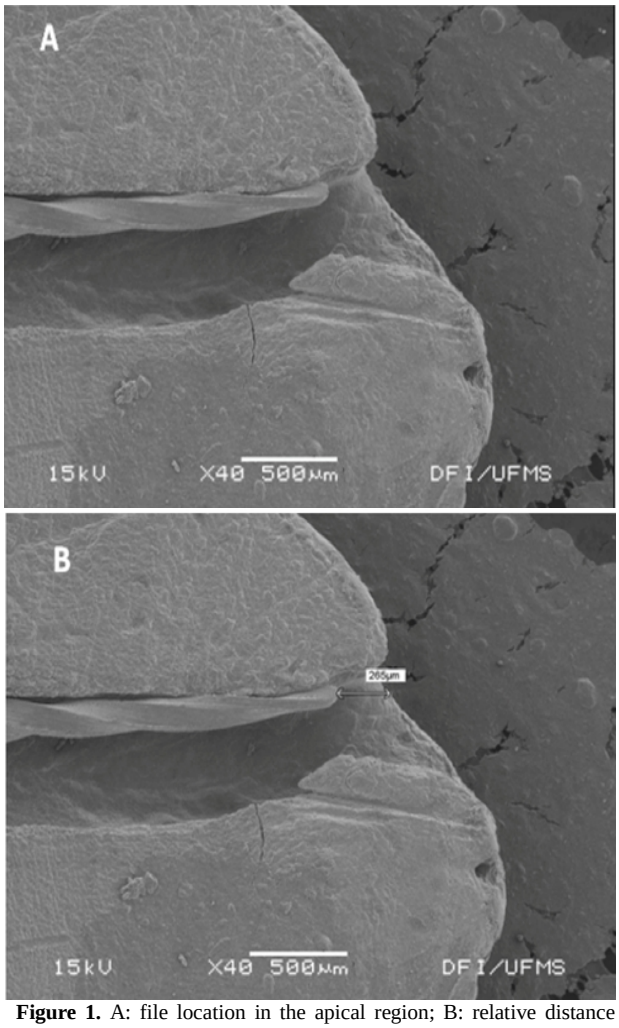

Figure 1. A: file location in the apical region; B: relative distance from the tip of the file - foraminal real output (I-FA).

We used the scanning electron microscope (SEM) JSM - 6380LV (JEOL®, Japan), increasing 40 or 50 times and photographs were taken to measure relative distances the tip of the file – via actual output foraminal WITHOUT User Control software interface Version 7.6 Copyright © 2004 (JEOL Technics LTD., Japan) (Figures 1 and 2).

Data analysis was performed using statistical analysis under the Anderson-Darling test and Student's t test.

3. RESULTS

The study consisted of a sample of 21 elements, which was measured the distance from the tip of the instrument to the apical foramen of the analyzed teeth (variable I-FA) in millimeters, with positive values for instruments that have passed the apical foramen and negative (-) for instruments that fell short of the foramen.

Through the scatter plot (Figure 3), one can get an idea of behavior and how the data is distributed. It is

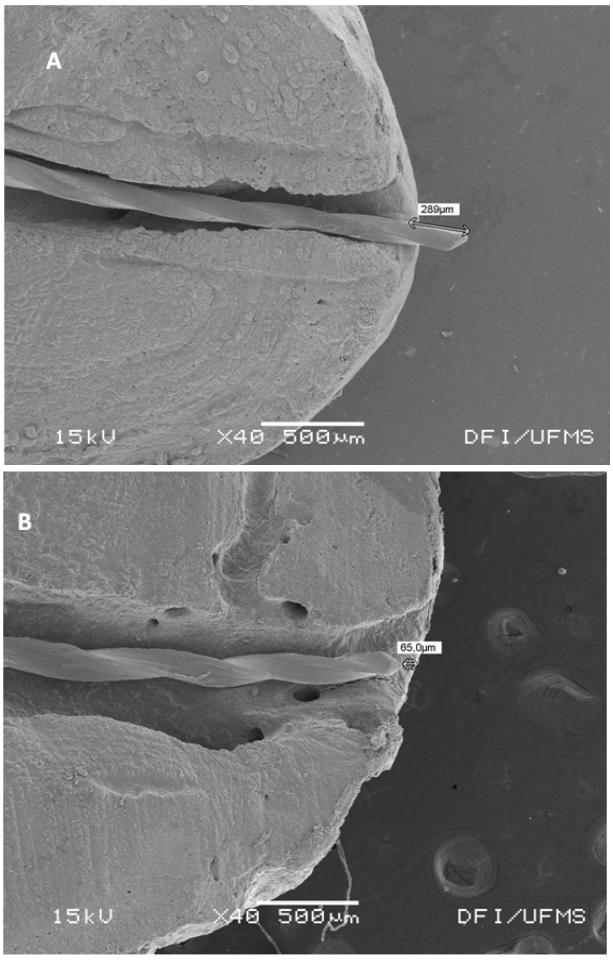

Figure 2. A: file position exceeding the apical region; B: relative distance from the tip of the file - real foraminal exit.

noticed that 9 values were negative and 12 positive, moreover, much of the data is between - 0.3 and 0.3 mm.

To verify the normality of the I-FA sample variable data made up the Anderson-Darling test. It was found that the sample showed normal distribution p-value (0.240) under significance level of 5% ($\alpha = 5\%$). After, we proceeded with the t-test in a single sample to verify, under the null hypothesis, the average assumption of variable I-FA equal to 0 (zero), the test statistic value and p-value (0.097) and significance level $\alpha = 5\%$, the average does not reject the hypothesis of 0 (zero) of the variable I-AF.

The sample data showed an average of 0.116 mm for the variable I-FA, reasonably close to zero. Presented right balance between positive and negative values, with the highest data concentration between - 0.3 to 0.3 mm.

For inferential analysis ($\alpha = 5\%$) it was found that, statistically by Anderson-Darling method, the data are normally distributed, using t test, it is concluded that there is significant evidence for rejection average R-FA is equal to zero (apical foramen).

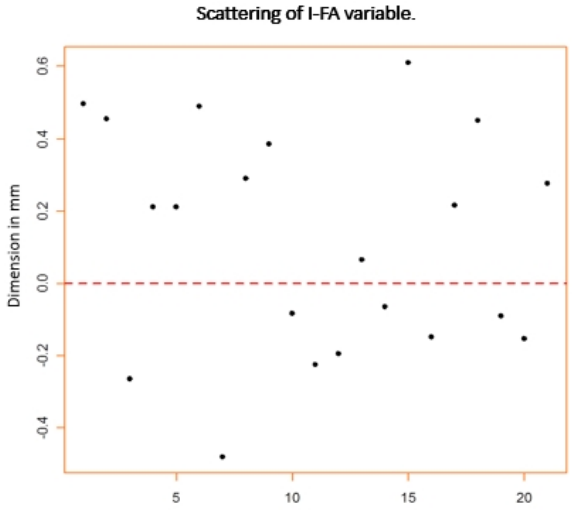

Figure 3. Scatter plot of the variable I-FA.

4. DISCUSSION

Mechanical preparation and endodontic filling, should be limited to dentin canal, histologically area occupied by pulp tissue[2]. The big challenge is to define the working length in function of the apical limit of instrumentation and filling mainly because evidence shows that the correct location is a crucial factor for the success of endodontic treatment[13].

Radiographic of odontometry methods are still the most used and disseminated to clinicians in helping endodontic therapy. However, it is difficult to obtain radiographs without distortion[5,14]. The location of the apical foramen does not coincide in over 60% of cases with the root apex and the distance between these structures varies from 0 to 3 mm[15,16]. Thus, we find that it is virtually impossible to pinpoint the location of the apical foramen, based on the radiographic apex.

The shift of the foramen should be considered during endodontic treatment, for the radiography does not detect the deviation[17]. This data is most critical when evaluating teeth with pulp necrosis carriers of periapical lesions visible radiographically as conventional radiographs are not adequate resources in the diagnosis of apical root resorption in the early stages and this problem is accentuated when the root lysis is present in the face buccal or palatal root involved[18]. Thus, faced with a treatment that requires precision so that success is achieved, radiography should not be isolated and conclusive factor in determining the limit instrumentation and filling of root canals.

The use of electronic devices in odontometry is increasingly common in endodontic practice. Electronic locators foraminal (LFE) does not have the same limitations of radiographic methods and the benefits achieved with their use are well known. The third generation apparatus can be regarded as the most reliable method to determine the working length in endodontic therapy[10,12,19]. They were executed in vivo studies in order to attest to the accuracy and reliability of the electronic method[10,20]. These studies selected patients with teeth extractions indicated for periodontal, orthodontic or prosthetic reasons. This methodology is often used because it offers closer to what happens clinically results as it provides direct visualization of the apical limit of the property determined by the electronic method for the actual position of the largest foramen.

This study used a methodology similar to most in vivo studies evaluating the accuracy of LFEs, differing in diversification of morphological groups of teeth, instrument fixation type in the channel and especially the visualization method and measurement of the actual position end of the instrument and the actual output of the apical foramen.

The preparation of the cervical and middle thirds was carried out with drills Gates-Glidden[10], prior to measurement, since according to the results found in the study[21], who evaluated the Root ZX locator, the values obtained by the device with progressive instrumentation technique found them much closer to the real working length. This fact is probably due to the instrument could play more wall in the apical region causing more effectively read the impedance region[22].

This research used as irrigating solution sodium hypochlorite to 2.5%, which has no influence in the process of electronic measurement[23,24]. It was not taken care to remove the excess liquid from the pulp chamber, which prevents the irrigating solution contact with the external environment the pulp cavity, promoting a shift in the passage of electric current, leading to device read error[10,20].

The methodology option by measuring the Scanning Electron Microscope (SEM) was adopted because this equipment has great magnification power with high image quality, providing high sharpness, depth of focus (image three-dimensional appearance) and has specific software accuracy for measuring measurement units. Aiming to verify the accuracy of a machine working in tenths of millimeters, a tool that is accurate in measuring quality should be the choice for evaluation, because we have to get reliable measures, which do not compromise the search result[10,25].

The measurements were performed under conditions and clinical variables belonging to the own endodontic treatment and gathering the group investigated morphologically different types of teeth, thus achieving a greater diversification of possible anatomical situations during the experiment[10,19,25].

Measurements of the apical foramen were performed using the demarcation of the corresponding device to "0.0" (green LED), which corresponds to the location of the apical foramen in QUILL® locator. The location of

the apical foramen through electronic odontometry is currently considered the most correct way of using LFEs[22]. The accuracy of performing the measurement reading with anatomically as the apical foramen is explained in a study[9] which evaluated in vivo, a modified version of QUILL® device designed especially for the experiment. For this, a total of 21 root canals were analyzed and the results demonstrated the ability of the foramen locator based on ray method in locating the apical foramen. The results also demonstrated and explained because the impedance locators based on the radius of the method are not able to determine the end of the file into the root canal with accuracy. According to the authors, the reason why this happens is because the impedance distance (or range) will not change significantly in this region. These points, in the case of QUILL®, corresponding numeric markings between 3 and 0.5 from the apical foramen and can only be used by dentists as a reference to find the file that the tip is near the apical foramen.

The diameter of the file connected to the electrode must be compatible with the diameter of the canal in the apical area, favoring the accuracy of LFEs[26,27]. Thus, in teeth with complete root formation, electronic measurement should be performed gauge compatible files. To read the samples in this study, files were used 10, 15 and 20, as were those best adapted for reading, after cervical and middle preparation of root canals[11].

When analyzing the results of the experiment, we note that the statistical tests, relating to data supplied by the readings QUILL® device in relation to point 0.0, did not represent statistically significant differences [10,19,23,25,28].

The sample data showed a mean of 0.116 mm to variable filling I-FA, reasonably close to zero. It did not present any data discrepancy and yes right balance between positive and negative values, with the highest concentration data in the range of - 0.3 to 0.3 mm. Similar data were found[19], which investigated the accuracy of the gold standard unit of accuracy and reliability in the scientific literature, Root ZX® in locating the apical foramen. The authors found 96.2% accuracy within a range of 0.5 mm.

According to the biological pulp conditions the QUILL® behaved within an acceptable clinical limit of determination of the working length; as from the location of the apical foramen the endodontist can do decrease of 0.5 mm or 1 to start the preparation root canal and in accordance with the values of the measures found. Always procedures instrumentation and filling would be contained within the root canal, close to the desired limit for the endodontic therapy, the CDC limit.

The variation of the measures in specimens values can be clarified by the complex anatomy of the root canal in its apical third. In cases where there is the presence of large lateral canals, the measures may be influenced, marking a shorter working length[23]. This statement is in line with the results of[29], which investigated the relationship between impedance and root apical anatomy human teeth and demonstrated that the impedance values found in root canal with a single foramen were significantly higher when compared to complex anatomy (several foramen). Thus, the apparatus described played increasing the apical third of the canal capacitance generating shorter readings.

Considering: the importance of establishing a correct apical limit of instrumentation and filling that respect the biological space delimited by the apical tissues, and the limitations of the radiographic method in the precise location of this limit, the QUILL® device was capable and reliable in locating the apical foramen, as from the identification of this anatomical structure. We can back 1 mm to stay close to the average of the desired limit by professionals, ie the apical constriction and CDC also limit.

5. CONCLUSION

According to the results the QUIL® apex locator (Ultradent, USA) was accurate and reliable in locating the apical foramen *in vivo*.

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MOLAR EXTRACTION IN SEVERE OPEN BITE TREATMENT

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ABSTRACT

Treatment of anterior open bite in adults is a great challenge to the orthodontist. When the open bite is skeletal, it increases the difficulty of its correction and stability of the results at the end of treatment. Surgical-orthodontic treatment may be an option for the correction of this malocclusion, although many patients refuse this treatment option and prefer the compensatory treatment. This work aims to report a case of severe open bite, treated with orthodontic compensation, extraction of four first molars and use of anterior intermaxillary elastics.
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KEYWORDS: Teeth extraction, Class I malocclusion, case report.

1. INTRODUCTION

Anterior open bite malocclusion represents a great challenge to orthodontist in relation to its treatment and stability. This is even more observed in the adult patient because they do not have the potential for growth modification. In these cases, orthognathic surgery is often required for the correction[1]. The etiology of anterior open bite is multifactorial[2,3], i.e., several factors interacting and operating within a potential and growth inherent to each subject cause this malocclusion, such as skeletal pattern, backward rotation of the mandible, vertical maxillary excess, abnormalities in dental eruption and tongue posture problems[4]. It is one of the most compromising esthetic and functional malocclusions, besides the dental and skeletal alterations.

In adults, the treatment of this malocclusion is very difficult, as much to the closure of anterior open bite as to the stability of the results at the end of the treatment[5-7]. In these patients, the orthopedic treatment presents a big restriction because of the lack of growth potential, suggesting this way, that the treatment is performed mainly by orthodontic camouflage (dental balance) or, in severe cases, aided by orthognathic surgery[8]. Nowadays, several authors have worried about preconizing non-surgical methods to the treatment of anterior open bite in adult patients[5,6,9-11]. However, when the skeletal factors are associated to the problem, the most suitable treatment is the surgical-orthodontic[1]. Many patients do not accept this treatment option, due to financial problems, or "horror to surgical procedures", or even for not wishing to change the facial appearance[12]. In these patients, the option is the compensatory treatment (camouflage) of the anterior open bite, and for this there are some factors described by authors which the orthodontic mechanical benefits the treatment and the final stability[1,6,10].

The present article reports a clinical case of a hyperdiverging adult patient who manifested an anterior open bite with skeletal compromising, whose first treatment option was surgical-orthodontics (maxillary impaction). However the patient was reluctant to this treatment option and chose the compensatory treatment, with the extraction of the first permanent molars and a different bonding protocol of orthodontics accessories in the maxillary and mandibular anterior teeth and in the mandibular posterior teeth.

HISTORY and DIAGNOSIS

A 19-year-old female presented to the private clinic with the main complaint of an unpleasant and anesthetic smile due to the presence of severe anterior skeletal open bite. The patient had a pleasing facial esthetics (Figure 1) and a Class I malocclusion, with the mandibular molars with mesial tipping.

Figure 1. Pretreatment extraoral photographs.

The esthetics smile was severely compromised due to the presence of severe anterior open bite of 4 mm between the maxillary and mandibular incisors (Figure 2).

Figure 2. Pretreatment intraoral photographs.

The patient had a bilateral Class I molar relationship and did not show any missing tooth (Figure 3).

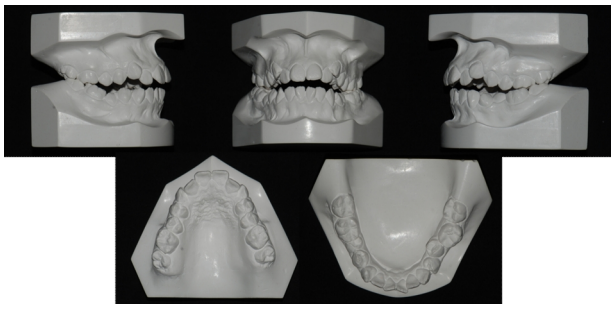

Figure 3. Pretreatment dental casts.

The bite was open from the anterior teeth to the second molars. Additionally, the maxillary and mandibular dental arches had moderate crowding. Cephalometrically, there was a mild Class II skeletal relationship. The patient had significant incisor protrusion that contributed to the skeletal Class II relationship and increased lower anterior face height. There was a bimaxillary dentoalveolar protrusion as evidenced by proclination of the maxillary and mandible incisors. There was an increase in the vertical maxillomandibular relationship in addiction to an increased mandibular plane (FMA 34.6) (Figure 4).

Figure 4. Pretreatment cephalometric radiograph.

The panoramic radiograph showed partially impacted mandibular third molars and periapical radiographs showed characteristics of normality (Figure 5).

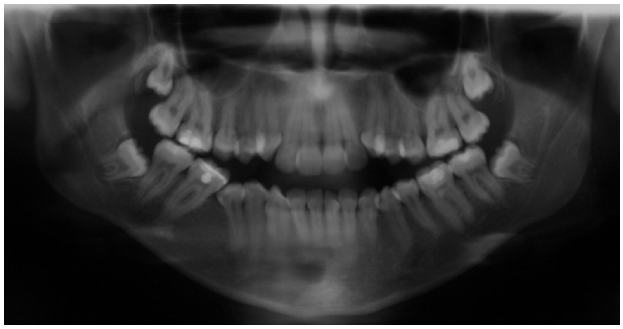

Figure 5. Pretreatment panoramic radiograph.

TREATMENT OBJECTIVES

The treatment objectives were to: 1) reduce protrusion by retraction of the anterior arch; 2) close the open bite by extrusion the maxillary and mandibular anterior teeth until an acceptable overbite-overjet relationship is achieved and 3) prevent extrusion of the posterior teeth, improving her smile esthetics.

TREATMENT ALTERNATIVES

Establishing completely different characteristics of anterior open bite types, it is extremely important to consider its nature and classification in order to choose the proper treatment. The same treatment accomplished in dentoalveolar and skeletal open bites present completely different prognosis demanding an observation of these characteristics to the correct prognosis, treatment planning and mechanotherapy to be used.

The underlying malocclusion in this woman involved dental alveolar and skeletal discrepancies. The dentoalveolar protrusion could be addressed with the four first premolar or first molars extractions. This would allow proper inclination of the maxillary and mandibular incisors, relieve periodontal pressures in the mandibular anterior area, and aid in closure of the anterior open bite. Ideal Class I molar and canine relationships could be established with this extraction pattern, but the skeletal discrepancies would not be addressed. A surgical treatment alternative could be used to correct the anterior and posterior vertical skeletal imbalances. This alternative would require extractions of the teeth to decompensate incisor angulation. Anchorage requirements in the maxillary arch would be minimal. The orthodontic anterior open bite would not be closed. The vertical discrepancy would be corrected surgically by impacting the posterior maxilla and allowing the mandible to rotate counterclockwise. A sagittal split mandibular advancement might be necessary if the rotation of the mandible was not adequate to correct the anterior and posterior discrepancy. This surgical treatment alternative would resolve the skeletal problems and produce a profile change that would be greater to the chance realized with the nonsurgical orthodontic approach.

TREATMENT PROGRESS

The patient refused the surgical-orthodontic treatment and the compensatory orthodontics treatment (camouflage) was chosen. The treatment consisted in the extraction of the maxillary and mandibular first permanent molars and different bonding protocol of the orthodontic accessories in the maxillary and mandibular anterior teeth, and in the mandibular posterior teeth to make them to present a mesiodistal verticalization during treatment and closure of the anterior open bite also with vertical intermaxillary elastic. The treatment of anterior open bite by dental compensation has the goal of promoting an acceptable occlusion, besides propitiating the esthetics of the smile to the patient. In this treatment context, the skeletal inconsistency would be camouflaged by the compensatory dental position[13,14].

The bonding of the accessories toward to the cervical in the anterior teeth was performed. As the alignment and leveling stage started, the anterior teeth suffered a greater extrusion than the posterior teeth, allowing a more efficient closure of the open bite. Considering the characteristic of the posterior teeth more mesially angulated in skeletal open bite patients, some authors defend that the treatment must be accomplished with the verticalization of these teeth related to the occlusal plan in order to promote a better function and stability of the treatment[10,15]. This may be accomplished, modifying the angle of the accessory at the orthodontic bonding moment. Initially the posterior teeth are mesially to the occlusal plan, during the alignment and leveling they would tend to distalize their crowns, rotating the occlusal plan counterclockwise, in other words, the closure of anterior open bite[10,15].

2. RESULTS

Positive facial changes were due to the incisor retraction and lack of significant increase in lower anterior face height (Figure 6, Table).

Figure 6. Posttreatment extraoral photographs.

Ideal Class I molar and canine relationships were achieved along with a good overjet and overbite. The incisors were tipped palatally to reduce the protrusion and close the bite. The posterior teeth were not extruded as the second maxillary molars moved slightly to the mesial with space closure. The mandibular incisors were lingually tipped and slightly extruded to close the open bite.

To maintain the Class I molar relationship, the molars were mesial moved without extrusion (Figures 7 and 8).

Table 1. Pretreatment and posttreatment cephalometric measurements.

Cephalometric measurements	Pretreatment	Posttreatment
SNA(º)	86.2	84.2
A-Nperp	3.2	3.6
Co-A	82.2	83.1
SNB(º)	81.5	80.7
P-Nperp	-0.6	1.2
Co-Gn	121.2	121.5
ANB(º)	4.7	3.5
FMA(º)	34.6	31.1
SN.GoGn(º)	38.1	38.4
SN.Ocl(º)	20.9	20.1
LAFH	76.9	73.2
1.NA(º)	21.9	18.2
1-NA	4.6	3.3
1.PP(º)	117.4	112.5
1-PP (mm)	30.0	31.2
1.NB(º)	31.9	27.1
IMPA(º)	88.8	86.2
1-NB (mm)	7.9	6.0
1-MP (mm)	40.3	41.2
Overjet (mm)	2.6	2.8
Overbite (mm)	-5.0	0.7
Interincisalangle(º)	121.5	131.1
LL-E (mm)	-0.5	-2.7
UL-E (mm)	-4.0	-6.5
Nasolabial angle(º)	104.3	119.0

Figure 7. Posttreatment intraoral photographs.

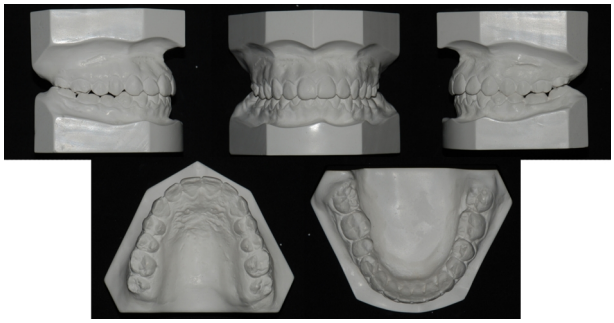

Figure 8. Posttreatment dental casts.

Cephalometric analysis at the beginning and at the end of active treatment showed that SNB angle increased from 81.5º to 80.7º, resulting in the anterior and posterior apical base relationship (ANB) to slightly decease from 4.7º to 3.5º. Both the maxillary and mandibular incisors were uprighted and the mandibular plane angle decreased from 34.6º to 31.1º (Figure 9). The posttreatment panoramic radiograph showed no caries, root resorption, periodontal bone loss, or changes in condylar form (Figure 10).

Figure 9. Posttreatment cephalometric radiograph.

Figure 10. Posttreatment panoramic radiograph.

3. DISCUSSION

The discussion will initially concentrate on the changes with treatment and later on the consequences of these changes on the dentoskeletal and soft tissue components. There was an increase in overbite of 5.7 mm, closing the bite to a positive overbite of 0.7 mm; this can be regarded as clinically significant because closure of the open bite was the primary patient concern. The results confirmed previous case reports demonstrating the efficacy of the procedure to close an open bite[6,9-11,14,16-19].

Additionally, with the cephalometric evaluation in this patient, it was found that the mandibular plane angle rotated in a counterclockwise direction. This rotation can be explained by the procedure chosen for the case in which first molar extractions were performed for correction of the anterior open bite. According to Andrade[20] the extraction of the first molars is indicated in cases in which the skeletal discrepancy is the preponderant factor in the maintenance of the open bite. The removal of dental contacts of the region of the first permanent molars, by means of dental extractions, promotes the mesial movement of the second permanent molars, which favors the change of the fulcrum of contact, providing a counterclockwise rotation of the mandible. This would result in a higher and anterior position of the mandible, reducing the hyperdivergency of the mandibular plan[20].

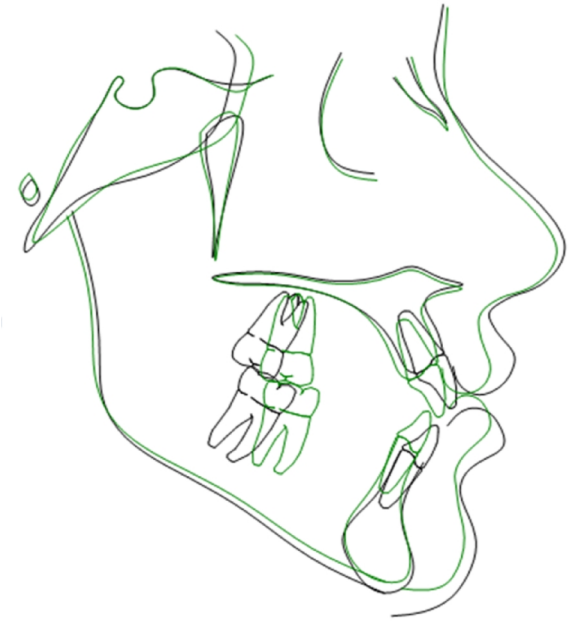

Figure 11. Initial and final cephalometric tracing superimpositions.

The extraction of four first molars was chosen in this case. The extraction of first molars is not often observed in the orthodontic literature, as a treatment alternative to this type of malocclusion. By adopting this protocol, it is speculated that the posterior segments will move mesially, aiding in the counterclockwise rotation of the mandible, thus providing a good incisal guide. Nevertheless, the removal of first molars, does not consist, obviously, in a routine orthodontic treatment procedure due, first of all, to the fact that the first maxillary molars have been considered the key elements since the times of Angle[21], and because it relates to the complexity of the mechanics to be used by the orthodontist when the first molars are extracted[22]. This treatment approach may be perfectly applied, since it is not more time-consuming than the conventional treatment with premolars extractions. The spaces of the extractions were closed with current rubber helping the closure of open bite, which also were accomplished with anterior vertical rubber inter maxilla. To Martina *et al.* (1990)[19] the response to the treatment of patients with anterior open bite becomes more efficient with the removal of the first permanent molars, because the segments would move to the mesial, resulting in a counterclockwise rotation of the mandible, thus favoring the achievement of good incisal guidance. According to the values obtained with the treatment for

the mandibular plane angle and the superposition of initial and final cephalometric tracings (Figure 11), it might be concluded that the results in this case corroborate with the authors mentioned before[19,22]. In the study by Jensen[23], it was concluded that the extraction of the four first premolars followed by the four third molars to the treatment of anterior open bite is equivalent to the loss of 25% of dental material. On the other hand, the removal of the four first molars is equivalent to the loss of 12.5%, with a more conservative form of treatment[23]. For this, it must be considered the presence of clinical or radiographic position and the size of the third molars[23,24]. In this case, it is observed in the initial panoramic radiograph the presence of third molars in excellent conditions.

The superimposition showed that there was minimal growth of the maxilla and the mandible during treatment, and profile improved significantly (Figure 11). Overlap of the maxillary structures indicated that there was palatal inclination of maxillary incisors (Figure 11). Extraction of the first premolars has been accepted by many clinicians in the management of the skeletal open bite, due to the e effect of reducing the inclination of both maxillary and mandibular incisors to increase overbite. Alternatively, molars can be extracted, to supposedly remove the wedge that opened the bite[25,26]. The orthodontic literature contains scarce reports related to the treatment of the open bite with extractions of the first molars. However, it was verified that the correction of the open bite with extraction of the first molars allow the mesial movement of the maxillary posterior segment, helping in the counterclockwise rotation of the mandible, decreasing the mandibular plane angle and the lower anterior face height, facilitating this way the achievement of an anterior positive overbite[10,17,22]. To use this treatment a correct treatment planning should be made, with detailed diagnosis, which assesses the growth pattern, hereditary factors, deleterious oral habits, functional changes, growth potential, besides the cephalometric analysis[19]. As mentioned before, the mesial movement of the second permanent molars, and therefore the fulcrum, promotes the reduction of hyperdivergency between the mandibular and palatal planes, due to the rotation of the mandible in a counterclockwise direction, favoring the closure of the anterior open bite[19].

In the present case, facial changes were due to incisor retraction and lack of significant increase in lower anterior face height (Table I). Ideal Class I molar and canine relationships were achieved along with a good overjet and overbite (Figure 06). The incisors were lingually tipped to reduce the protrusion and close the bite (Figure 06). Considering the skeletal pattern and the nonsurgical approach that was chosen, excellent occlusal and facial results were achieved (Figures 05 and 06). Ideal overbite was established, and good root uprighting into the extraction sites was achieved (Figures 08 and 10). In the panoramic radiograph, an injury on the top of the right second mandibular premolar was observed. The patient was clinically evaluated and an injury occurred as a consequence of recurrent dental caries under the large restoration that this tooth had. After this evaluation the tooth was properly treated, and the patient had no major damage.

According to the superimposition of the cephalometric tracings: initial, final and retention, it is observed that was performed a correct choice of the treatment planning to this case, because of the great facial and occlusal esthetic earnings that the patient had.

4. CONCLUSION

The molars extraction constitutes a favorable option treatment for the decreasing of vertical dimension in patients with increased lower anterior face height and moderate negative overbite. Professional must conduct the mechanics of how to close the spaces, allowing a functional harmony, occlusal and satisfactory esthetic.

Moreover, with an accurate diagnosis and treatment planning, it can be corrected the esthetic and functional problems caused by this malocclusion, performing dental compensations through the extraction of the first molars, especially in cases of adult patients who are no longer growing. However, after obtaining a stable result regardless of the applied therapy, the patient should be referred for speech evaluation to normalize some disorder of tongue posture. Only then, the orthodontist can offer a more effective treatment with less risk of relapse.

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ROOT RESORPTION IN ORTHODONTIC TREATMENT WITH EMPHASIS ON DENTAL INTRUSION

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ABSTRACT

The present study on orthodontic root resorption addresses factors associated to root resorption occurrences and reports some procedures that must be followed before and during orthodontic treatment. Factors related to patients and technical procedures are closely linked to the occurrence of this pathology. Some other procedures as: periapical radiographs of anterior tooth; following-up periapical radiographs of the anterior teeth after six months of treatment; if the resorption was diagnosed, treatment discontinuance from 60-90 days and reevaluation required to continue the treatment, are very important and must be considered with each and every patient undergoing orthodontic treatment.

KEYWORDS: Orthodontics, dental intrusion, root resorption.

1. INTRODUCTION

The occurrence of root resorption in Orthodontics is quite evident, so much that several authors state that the orthodontic movements increase the risk of root resorption, which is the main and more frequent cause in the western population[1,2].

Orthodontists sought the best approach of orthodontic treatments to achieve the best results in shape, function and dentofacial aesthetic, but not worrying about the occurrence of root resorption. Currently, professionals reach the same goals in the completion of orthodontic treatments, but concerning about the root resorption, focusing on prevention. Severe and structurally important root resorption occurs in 10% of people undergoing orthodontic treatment[1]. In most orthodontic treatments, no impairment of functional capacity and longevity of the affected tooth occur. The forces applied on the teeth to achieve effective movements must promote some degree of stress on the periodontal tissues, either by hypoxia, or compression[3].

This study addresses the relationship of resorption with mechanical intrusion, because root resorption exhibits higher incidence in this type of orthodontic mechanics. When the intrusion is associated with higher corrections, it induces more root resorption. It should be emphasized the differentiation of pure or isolated intrusion movements, from those of an intrusive mechanics in which there is a combination of movement types and greater movements[3].

In orthodontic treatment, many malocclusions have a deep curve of Spee, which contributes to a deep overbite; therefore, it is necessary to level the curve of Spee both for functional reasons and those proposed by the orthodontic treatment. Accordingly, it is very common to use archwires with reverse and marked curves to correct the overbite. This implies in individual tooth movements, with the intrusion and protrusion of the anterior teeth as the most common effects[4,5].

Studies have not exclusively evaluated the intrusive mechanics characterized by the use of archwires with reverse and marked curves and their effects on the degree of root resorption[4].

This paper aimed, then, to review the literature and search for general considerations that help to prevent certain occurrences, so that mainly root resorption can be minimized[6].

Capelozza Filho *et al.* (1998)[1] suggested that the etiology of root resorption seems to depend on genetic, physiological and anatomical variables. Thus, didactically they classify the factors in general, local and mechanical. According to the authors, the general factors include heredity, gender, age, and health status. As for local factors, these are represented by the type of malocclusion, habits, history of previous trauma, root development stage, root shape, and oral health. There are also mechanical factors that are part of the orthodontic force magnitude, the force application interval, and the force type and duration.

According to Sameshima & Sinclair (2001)[7], the resorption occurs mainly in maxillary anterior teeth with marked positive overjet and deep overbite, due to the

demand for greater torque, amount of root displacement and intrusion, required to correct this type of malocclusion.

Of the tooth movement in Orthodontics, the intrusion and retraction are associated with root resorption. The intrusion is an aggressive and harmful movement to periodontal structures, so it is often related to external apical root resorption during orthodontic treatment[3].

Apical root resorption is a serious iatrogenic event associated with orthodontic treatment. It is believed that they result from a complex combination of individual biology and effects of mechanical forces[8]. Several factors have been implicated in the initiation and progression of external root resorption during orthodontic treatment, divided into host factors, local factors and factors related to orthodontic mechanotherapy. The magnitude of orthodontic forces was shown to be an etiological factor in the external apical root resorption (EARR). The external root resorption is a common sequel of orthodontic treatment and can occur in the absence of this. Genetic factors account for at least 50% of the variation in EARR[9]. The apical root resorption is defined as a pathological or physiological process resulting in the loss of cementum and dentin[10].

The intrusion is often cited as a cause of great risk for apical root resorption and resorption on inter-root or bifurcation region[2,8]. Apical root resorption depends on the intensity of orthodontic movements. In orthodontic movement, the driving inclination forces promote compression of the tooth's periodontal ligament on the alveolar bone surface[2,3].

Several authors investigated the intrusion as a possible cause of resorption. As a result, they found that the intrusion can be performed with light force to reduce the overbite while causes negligible apical root resorption[11,12]. Compared with the continuous force, orthodontic intermittent activation may be a reliable method to prevent significant root resorption[11,13,14]. One should be aware that the extrusion can also cause resorption in susceptible patients[12].

Studies show that patients treated with mechanical intrusion to accent and reverse the curve of Spee had statistically greater root resorption than patients with normal overbite not receiving this mechanics[11]. In general, there was no difference in the amount of root resorption among the appliance systems and between age, sex and extraction treatment, but in the treatment duration a difference was observed[15]. There was no difference in root resorption between the conventional and the self-ligated systems[16,17].

From the geometric point of view, the shape of the roots can be classified into triangular, rhomboid and quadrilateral. By applying the same type of force and tooth movement, the triangular roots tend to concentrate higher forces on a smaller apical area than the rhomboid and quadrilateral shapes. Therefore, these types of short roots tend to undergo more resorption during orthodontic movements[7,12-14,18,19].

In the context of orthodontic technique, some technical and operational aspects are mentioned as enhancers of the highest frequency of root resorptions, for example:

- The use of intermaxillary elastics;
- Extraction in the context of the treatment;
- Intrusive mechanical;
- Extensive tooth displacements.

The literature affirms that only 10% of root resorption in orthodontics are severe, so it is indicated that periapical radiographs of the upper and lower incisors are routinely performed in adolescents and a series of radiographs in adults as usual preventive procedure, previously at the beginning treatment[10,18,20]. During orthodontic treatment, it is recommended that periapical radiographs of the upper and lower incisors should be taken at every six months for controlling the biological cost of mechanotherapy. The higher predisposition to resorption of maxillary incisors is related to the extension of movement of these teeth as a result of malocclusion, function and aesthetics correction[10]. If at the radiographic examination, there is evidence of a minimum or no resorption, it can be stated that the patient is at low risk of severe resorption at the end of treatment, so the same treatment regimen is maintained. If detecting a moderate absorption, the patient is at regular risk of severe resorption and small risk of marked resorption at the end of treatment. In these cases, a rest period (passive archwire mechanically stabilized) from 60 to 90 days is recommended and the susceptibility must be communicated to the patient[10,21].

Following the literature, the routine requires practicality in the management and planning. For this purpose, there are 10 topics to be remembered during orthodontic treatment to prevent the root resorption and its consequences:

- Conduct a thorough medical history to find previous treatments, dental trauma history, replantation, and jaw surgeries;
- Make a periapical radiographic evaluation of all teeth during the planning of the case. In 7-10% of cases of patients without orthodontic treatment root resorption has been diagnosed, which may be exacerbated during orthodontic treatment; if not diagnosed during treatment planning, they will be later assigned to the treatment itself.
- harmonize the use of less aggressive forces and moves to root morphology, maxillary bone crest when these aspects are unfavorable;
- When planning external movements, reveal the most probability of causing resorption in such cases;
- Indicate extractions when strictly necessary;

- Consider that the use of intrusive mechanical is favorable to the occurrence of root resorption;
- Worry about the distribution of forces preferably regarding to the occurrence and intensity;
- Six months later, re-evaluate radiographically whether or not significant resorption occurred. If diagnosed, discontinue treatment for 5-8 weeks and then return normally. This maneuver decreases significantly tooth shortening at the ending of orthodontic treatment.
- In cases of retreatment or transference of patients, previously promote a thorough assessment of periapical radiographs to have knowledge on the diagnosis of the current case situation.

2. CASE REPORT

K. F. A, female, aged 10 years and six months old, attended the clinics complaining about the diastemas. At extraoral analysis, face balance with convex profile and presence of passive lip seal was observed (Figure 1).

Figure 1. Initial extraoral photographs.

At intraoral and radiograph examination, Class I bilateral malocclusion, diastema between the upper front teeth, overbite of approximately 3-4 mm, slightly flaring of the maxillary central incisors, and presence of some deciduous teeth were present (Figures 2 to 5).

Figure 2. Initial intraoral photographs.

Figure 3. Initial Lateral Cephalogram.

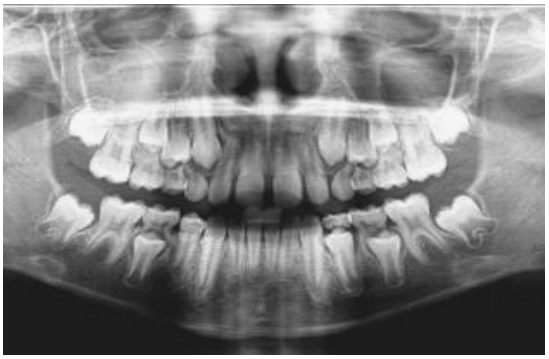

Figure 4. Initial panoramic radiograph.

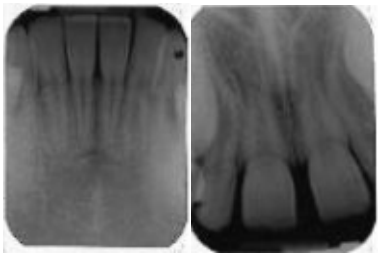

Figure 5. Initial periapical radiographs.

TREATMENT

The initial treatment was performed with installation of a removable expander with labial bow, due to patient's age and the presence of some deciduous teeth, used for 5 months (Figure 6). Then, the protocol with fixed appliances began by the cementation of orthodontic bands and bonding of maxillary brackets during 4x2 leveling, due to the presence of deciduous teeth (Figure 7). Pre-adjusted brackets with Roth prescription and 0.022 "x 0.028" slot were used. Due to the overbite, the mandibular appliance was installed after a few months.

The alignment and leveling were performed with 0.012", 0.014", 0.016", 0.018" Niti wires and 0.018" and 0.020" stainless steel wires with accentuation and reverse of curve of Spee.

Figure 6. Removable expander.

Figure 7. Beginning of 4x2 leveling

After alignment and leveling, we used the 0.017" x 0.025" and 0.019" x 0.025" Niti rectangular arches and then the 0.017" x 0.025" and 0.019" x 0.025" rectangular steel arches throughout alignment and leveling phase and finishing with rectangular arches, applying the accentuation and reverse of the curve of Spee, thus observing the severe root resorption, especially on the maxillary central incisors. The simplification of the mechanics was prioritized until orthodontic finishing as soon as possible (Figure 8).

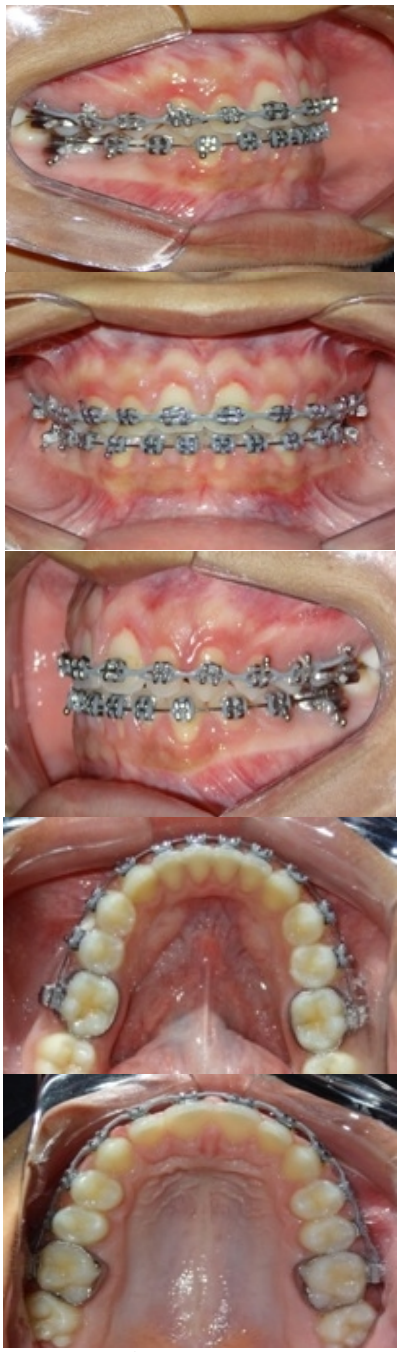

Figure 8. Intraoral photos; finalization phase.

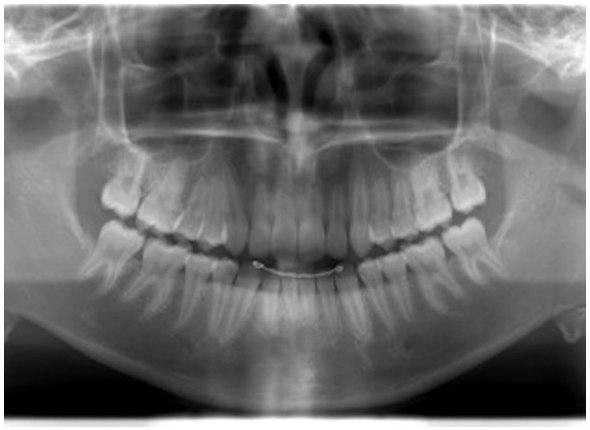

Figure 9. Final panoramic radiograph.

Figure 10. Final periapical radiographs.

Figure 11. Final Lateral Cephalogram.

The case ended with Class I bilateral occlusion. The patient was instructed to use Hawley and 3 x 3 retainers continuously for two years (Figure 12 and 13).

Figure 12. Final photographs.

Figure 13. 3x3 Mandibular retainer and maxillary Hawley retainer.

3. DISCUSSION

The intrusive mechanics is widely used in the treatment of overbite, because it promotes the intrusion of anterior teeth. It is known that the intrusive force causes stress mainly on the apex and therefore implies in damaging this area of the tooth, resulting in apical resorption[3,22].

Authors report that the force intensity applied during the initial period of intrusion can determine the final degree of root resorption, as the reaction of the intruded teeth varies according to the magnitude of the force exerted[2].

Of the orthodontic movements, the intrusion and root torque are the most likely causal factors of root resorption, which if combined, further increase the occurrence of this resorption[6,8,23]. The studies have recommended the application of light forces on the intrusion movements that depend on the magnitude of the applied force for prevention[1,8].

The overbite correction basically involves four types of tooth movement: anterior intrusion, posterior extrusion, incisor inclination, and differential growth of the maxillary and mandibular structures. Some types of treatment are more likely to cause extrusion of posterior teeth; others to cause intrusion of anterior teeth[4].

The extrusion of the posterior teeth can be obtained by use of the bite plates, because they prevent the contacts of these teeth, allowing the fast development of the posterior dentoalveolar area[4,5].

The leveling archwire with reverse and accentuated curve is another common approach for correcting deep bite. These archwires provide an intrusion force on anterior teeth and extrusion force on posterior teeth, combining both teeth movements[2,5,11].

The literature reports that root resorption is closely associated with certain risk factors that may be related to the patient and techniques themselves. As regards to Orthodontics, some clinical procedures should be adopted to prevent such resorption[3].

As can be seen, a large number of authors stated that the highest incidence of root resorption occurs on the maxillary anterior teeth, followed by the mandibular anterior teeth, first molars, canines and premolars[7,24].

Concerning to the prevention during orthodontic treatment, the authors suggest a periapical radiograph shot of the incisors after 6-9 months of treatment, as control, when the risk of resorption at the end of treatment is defined[3,10].

A protocol of actions has been recommend to be taken preventively after the detection of some degree of resorption according to the classification recommended by Levander and Malmgren at 6-9 months of treatment: instructing the patient's about the susceptibility to this root damage, panoramic radiograph to verify the remaining teeth, and perform the periodic following-up at every 90 days[16,26]. The authors do not advocate the rest period only for teeth with minimal resorption. For other types, they recommend mandatory rest from 60 to 90 days. For severe resorption, they suggest treatment optimization to reduce its duration. In extreme resorption cases, they advocate mandatory discontinuation of

treatment[6,10].

4. CONCLUSION

After the review of the literature on the occurrence of root resorptions in orthodontic treatment, we can conclude that there are factors related to the patient commonly associated with root resorption: group of teeth because the degree of resorption is higher in anterior teeth;

Root morphology: is an important risk factor during orthodontic treatment; gender, age and pulp vitality does not confer greater or lesser susceptibility to root resorption.

Factors related to technical procedures associated with root resorption: root approximation to lingual cortical: this occurrence caused severe resorption; root torque, intermaxillary elastics, extensive movements require careful planning and management; the intrusion is closely associated with the magnitude of the force used.

Some important approaches should be adopted before and during orthodontic treatment as:

- Periapical radiographs for the diagnosis of anterior teeth;
- Clarify the patient about the possibility and the risk of root resorption during orthodontic treatment;
- Periapical radiographs of anterior teeth after six months of treatment;
- if resorption is diagnosed after six months of treatment, inform the patient and discontinue the treatment for a period from 60-90 days; reassess and simplify orthodontic mechanics or even discontinue treatment in the event of severe or extreme resorption.

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COMPENSATORY TREATMENT OF SKELETAL CLASS III MALOCCLUSION WITH SELF-LIGATION APPLIANCE

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ABSTRACT

We present an account of a case of a malocclusion Class III with anterior crossbite where the chosen therapeutic option was the compensatory treatment. The compensatory orthodontic treatment of poor class III occlusion has been the first choice in dental offices because it is less aggressive to patients, especially in cases of mild or moderate skeletal involvement. We used to treat the Roth prescription with self-ligating brackets of the GAC brand - In Ovation R and the wires following the same brand with the projector. A positive horizontal overlap was achieved with the aid of further acrylic stand, made of laboratory, intermaxillary elastics and flaring bows with TMA wire. The excellent patient compliance with treatment, as well as the precise brackets and accessories are essential for the proper conduct and completion of the case. After 11 months, treatment was completed with very satisfactory results that will be presented throughout this work.

KEYWORDS: Malocclusion, Class III, Class III skeletal, self-ligating brackets.

1. INTRODUCTION

The Class III malocclusions, in orthodontics, is as complex and difficult cases to diagnose and treat, especially the origin and the different factors involved in this type of malocclusion. Thus, the dentoalveolar recognition and analysis of skeletal features are essential and possible, often a favorable compensatory treatment[1].

Studies show that 65% of Class III malocclusions are associated with maxillary deficiency, and in 30% of cases, this retrusion is due to a mandibular protrusion. Studies show that 65% of Class III malocclusions are associated with maxillary deficiency, and in 30% of cases, this is due to a retrusion mandibular protrusion. To identify this dysfunction, there is a consensus that it should intervene as early as possible to allow a suitable environment that provides the normal growth and facilitate the anterior maxillary advancement, improving occlusal relationship. In the adult stage, two types of treatment are the most commonly applied: the compensatory orthodontic treatment, orthodontic treatment associated with orthognathic surgery. Due to the high costs and risks that orthognathic surgery involves many patients are afraid to carry out combined treatments, and the compensatory treatment a satisfactory option for these cases. In this context, the techniques for Orthodontic Camouflage Class III have been improving more and more, with various types and prescription and brackets available for sale. Among these brackets are the self-ligating systems, which provide a lower bracket-wire friction when compared to the conventional system[2].

The self-ligating brackets are an important ally in modern orthodontic therapy today. Its main advantage is the lower friction with the orthodontic wire and the possibility of applying lighter and more biocompatible forces, reducing the risk of root resorption and periodontal damage in addition to the decrease of patient visits to the orthodontist's office during treatment[3].

The friction is defined as the greatness contrary to the movement of a body in tangential relationship to the surface of another, operating in the opposite direction to the same displacement trend. Associated with the use of elastic Class III, this system has been shown very efficient, since less resistance to movement, the upper front elements (incisors and canines) moved labially easily, and the lingual lower anterior elements, disguising the appearance of Class III present in this patient, and exercising a very satisfactory dental correction[4,5].

The objective of this paper is to present a case with Class III malocclusion and anterior crossbite treated with self-ligating system and intermaxillary elastics, culminating in excellent cosmetic result and occlusal harmony.

2. CASE REPORT

EPS patient, leukoderma, male, 39 years old, attended the dental clinic with complaints related to anterior crossbite and dismissing the possibility as surgical correction. In the early extraoral photographs, the patient

concave profile with with the lower face in balance and presence of passive lip seal (Figure 1). In the early intraoral photographs, the patient had severe anterior crossbite, with molar ratio of Class III right subdivision, and respect of Class III bilateral canines with coincident midlines (Figure 2).

Figure 1. Photographs initial extraoral.

Figure 2. Severe anterior crossbite, molar ratio of Class III right subdivision.

Figure 3. Initial panoramic radiograph.

The initial panoramic radiograph showed the presence of all permanent teeth including the upper and lower third molars. (Figure 3). The lateral teleradiography (Figure 4) showed a relationship deficiency in the maxilla and mandible (ANB = -4.5 degrees), horizontal growth standard (Pl Ocl = 3.5 SN / Sn.Go Me = 23, 5 / FMA = 16), protruding incisors, slightly vestibularized (1-NA = 5 mm / 1.NA = 25) lower incisors retruded and slightly lingually (1 NB = 2 / 1.NB = 21.3) (Figure 4 and Table 1).

Figure 4. Lateral teleradiography.

Table 1. Initial and final cephalometric variables.

CEPHALOMETRIC VARIABLE	INICITIAL	FINAL
MAXILLARY COMPONENT		
SNA (degrees)	77	77
A-Nperp (mm)	- 4,5	-4,1
Co-A (mm)	90	91
MANDIBULAR COMPONENT		
SNB(degrees)	82	81
P-Nperp(mm)	2,8	2
Co-Gn(mm)	122	123
RELATIONSHIP BETWEEN MAXILLA AND MANDIBLE		
ANB (degrees)	-4	-3
GROWTH PATTERN		
SnGo.Gn (degrees)	62	63
SnOclusal (degrees)	3,2	7,5
FMA (degrees)	12	15
DENTO ALVEOLAR COMPONENT		
1.NA	24	35
1-NA	5	8
1.NB	21	17
1-NB	3	0
IMPA	95	92

Objectives and Clinics Alternatives

The clinical development of this treatment aimed at aligning and leveling the upper and lower teeth, positive overjet (correction of anterior crossbite) and the correction of the molars and canines relationship.

Considering these objectives were addressed three treatment options: the extraction of two lower premolars, to correct the anterior crossbite; the ortho-surgical treatment; and dental compensation with orthodontic self-ligating brackets and intermaxillary elastics. The patient rejected the two surgical treatment options. He tirelessly sought a conservative treatment; did not need any surgery or tooth extraction.

Treatment Progress

They used the In-Ovation R appliance, Roth prescription master 5x5 slot 0.022 'x 0.030' 'brand GAC (Figure 9). The Home alignment and leveling was performed

with round wire nickel-titanium, Gauge 0.014 "in the upper and lower arches. It was continued with the sequence of upper and lower arches recommended by the manufacturer of the bracket, ie wires 16x25, 18x25 and 19x25 all nickel-titanium.

This alignment and leveling phase was accompanied by a rise acrylic lower arch, which provided the disocclusion region of the anterior teeth. After phase alignment and leveling, with 5 months of treatment, it began using arc upper buccal with 2 loops mesial to the molars, and away 2 mm of the buccal of the upper and previous elements, made of wire 17x25 TMA which, combined with the lower acrylic uprising provided the unwinding bite altogether (Figure 5).

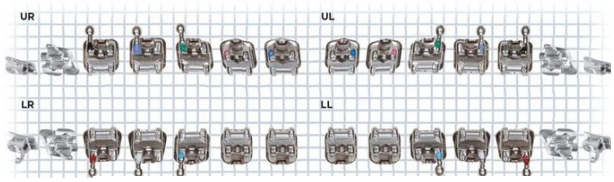

Figure 5. Alignment and leveling phase, accompanied by an uprising in acrylic on lower arch. **Fonte:** site GAC –www.GACortomax.com.br

Next, the patient used class III elastic 3/16 "(heavy), promoting force of 250 g on each side, to obtain Class I bilateral. Ideal arches steel wire were made for small occlusal refinements. After 11 months, self-ligation appliance was removed and the patient was instructed to use higher Hawley plate and lower fixed containment indefinitely. (Figures 6 and 7)

Figure 6. Patient with class III elastic 3/16 "(heavy), promoting force of 250 g.

Figure 7. Detail of the oral cavity of the patient with class III elastic 3/16 "(heavy), promoting force of 250 g.

Treatment Results

Final intraoral photographs show a very satisfactory correction of anterior crossbite with the presence of passive lip seal and harmonious face.

The anteroposterior relationship of the canines, which was the beginning of treatment of Class III has also been corrected. The patient was very pleased with the final result.

The cephalometric measurements after treatment show a similar maxilla positioning the initial measure compared the skull base, but a significant protrusion and buccal of the upper incisors in relation to their apical base (measured 1.NA and 1-NA; Table 1), which characterizes the "camouflage" orthodontic achieved through the use of intermaxillary elastics and flaring arches. Dental relations showed an improvement of molar ratio and the vertical and horizontal overlap. The patient profile has not changed.

Figure 8. Final extraoral photographs

Figure 9. Final intraoral photographs

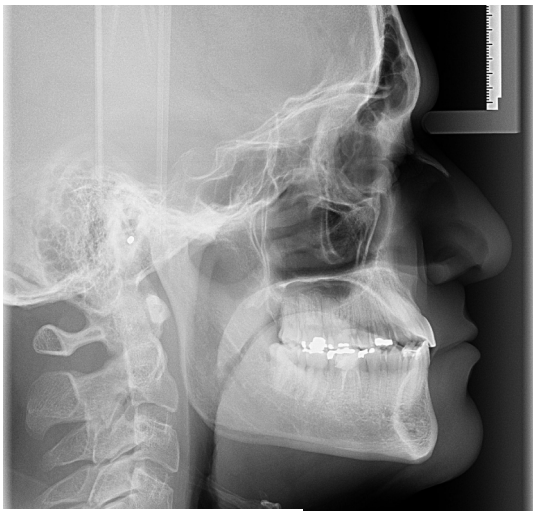

Figure 10. Final panoramic radiograph.

Figure 11. Final lateral teleradiography.

3. CONCLUSION

The orthodontic prescription used by the self-ligation appliance In-Ovation R system, combined with mechano therapy with intermaxillary elastics for correction of Class III skeletal and dental in the individual undergoing the study proposed in this work showed a satisfactoriness progression of orthodontic treatment with rehabilitation of dental relations proposals. Therefore, it was concluded that malocclusion Class III is likely to interventions dysfunction that bring good results in the long term and provide the resumption of a quality of life for individuals affected by this problem, and that the system can contribute positively self-ligation appliance in orthodontic practice, when properly indicated in these cases.

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