UNIVERSIDADE DE SÃO PAULO
FACULDADE DE ODONTOLOGIA DE BAURU

RAQUEL SILVA POLETTO

Comparison of apical root resorption at different times and malocclusions

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Comparação da reabsorção radicular apical nas diferentes épocas e más oclusões

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Orientadora: Prof. Dr. Guilherme Janson

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Dedico também ao meu avô Nello (in memorian), meu maior incentivador na profissão que escolhi.

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“A mente que abre a uma nova ideia

jamais voltará ao seu tamanho original.”

Oliver Wendell Holmes Sr.

ABSTRACT

Comparison of apical root resorption at different times and malocclusions

Introduction: External apical root resorption is a well-known consequence of orthodontic treatment. The objective of this study was to compare the apical root resorption in patients with Class I and Class II malocclusion treated with 0.021x0.025 inch archwire in anterior retraction with those who were treated with 0.019x0.025 or 0.018x0.025 inch archwire in anterior retraction and additionally to compare this patients emphasizing the initial malocclusion. **Methods:** A sample of 110 patients treated with four premolar extractions was divided into four groups, combined two by two. At first comparison the sample was divided in two groups: Group 1 (G1) consisted of 46 patients who were treated with 0.021x0.025 inch archwire in anterior retraction after four premolar extraction. Group 2 (G2) consisted of 46 patients who were treated with 0.019x0.025 or 0.018x0.025 inch archwire in anterior retraction after four premolar extraction. At second comparison the sample was also divided into two groups: Group 1 (G1) consisted of 57 patients with Class I malocclusion treated with rectangular archwire in anterior retraction after four premolar extraction. Group 2 (G2) consisted of 53 patients with Class II malocclusion treated with rectangular archwire in anterior retraction after four premolar extraction. All groups were matched regarding initial age, treatment time, sex distribution. Pre- and posttreatment lateral cephalometric and periapical radiographs were evaluated. Mann Whitney and t tests were performed to compare the initial status, the treatment changes and the quantity of resorption of the groups. **Results:** There was a greater extrusion of maxillary incisors in group 1 and the apical root resorption was greater in group 1 both in maxillary and mandibular incisors at first comparison. there were no difference in root resorption degree after orthodontic treatment between the groups at second comparison. **Conclusion:** Greater stainless steel rectangular archwire thickness produces more root resorption than thinner rectangular archwires. Class I and Class II malocclusions treated with 4-premolar extractions present similar degrees of root resorption. Therefore, correction of the sagittal discrepancy is not associated with a greater degree of resorption.

Keywords: root resorption; extractions; anterior retraction

RESUMO

Comparação da reabsorção radicular apical nas diferentes épocas e más oclusões

Introdução: A reabsorção externa apical da raiz é uma consequência já conhecida do tratamento ortodôntico. É importante determinar quais são os fatores dominantes para que o clínico possa ajustar o tratamento para cada paciente, a fim de evitar uma grande reabsorção externa da raiz durante o tratamento ortodôntico **Objetivo:** avaliar a quantidade de reabsorção apical externa em pacientes Classe I e Classe II que foram submetidos à retração anterior com o fio 0.021" x 0.025" e com fio 0.019" x 0.025" ou 0.018". **Material e Métodos:** A amostra retrospectiva foi selecionada do arquivo da Disciplina de Ortodontia da Faculdade de Odontologia de Bauru – Universidade de São Paulo e dividida em em 4 grupos: Grupo 1, casos de Classe I tratados com extrações, com fio retangular 0,021"x0.025"; Grupo 2, casos de Classe I tratados com extrações com fio retangular 0.019"x0.025"; Grupo 3, casos de Classe II tratados com extrações, com fio retangular 0,021"x0.025"; Grupo 4, casos de Classe II tratados com extrações com fio retangular 0.019"x0.025". Os grupos foram posteriormente reagrupados dois a dois e compatibilizados em idade, tempo de tratamento e distribuição de sexo para análises da reabsorção radicular com enfase na diferenças do calibre do fio utilizado na retração inicial dos grupos e com enfase na diferença da má oclusão incial dos grupos. Foram avaliadas telerradiografias em norma lateral e radiografias periapicais pré e pós-tratamento. **Resultados:** Na avaliação dos grupos com ênfase no calibre dos fios retangulares utilizados foi encontrada uma maior extrusão dos incisivos superiores no grupo de maior calibre (0,021"x0.025") e houve maior reabsorção radicular neste grupo. Na análise dos grupos com ênfase no tipo de má oclusão, não houve diferença no grau de reabsorção radicular entre os grupos. **Conclusão:** Quanto maior a espessura do fio retangular, maior a reabsorção radicular. A discrepância sagital não está associada à reabsorção radicular em pacientes Classe I e Classe II tratados com extração de quatro pré-molares.

Palavras-chaves: reabsorção radicular; extrações; retração anterior

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1 INTRODUCTION

1 INTRODUCTION

External apical root resorption is a well-known consequence of orthodontic treatment. It is characterized by a shortening of the root and occurs more noticeably only in some patients, since apical root resorption presents a multifactorial cause.[1] In most cases, root resorption resulting from orthodontic movement is minimal and it has no clinical significance, since it reaches mean values of 0.5 to 3 mm of root shortening.[2]

The concentration of orthodontic forces on the root, especially on the apex, can cause biological changes in the cementum and periodontal ligament, resulting in root resorption.[3,4]

The concern with dental resorption within Orthodontics had begun in 1914 with Ottolengui,[5] who was the first to raise the hypothesis of a possible relationship between root resorption and orthodontic movement. But it was proved radiographically only in 1927 by Ketcham.[6] In subsequent years, numerous studies about dental resorption were developed searching possible causes to associate root resorption and orthodontic treatment.

The quantity of orthodontic force absorbed by the tooth,[4,7,8] the type of treatment,[9-12] duration of treatment,[4,9,13-16] genotype[9,17,18] and age of the patient[9,16,19,20] are considered potentially contributing factors of root resorption.

Among dental movements, incisor intrusion and anterior retraction seem to cause the greatest root resorption during orthodontic treatment.[13,21,22] Besides, in the orthodontic mechanics some variables, like the use of fixed appliances,[23,24] the torque,[21] the use of rectangular stainless steel archwires[20,24,25] and the magnitude of the applied force[20] are related to root resorption.

In Edgewise mechanics, whether conventional or pre-adjusted, it is recommended the sequential exchange of orthodontic archwires, from the smallest to the largest caliber. The progressive exchange of archwires aims for a great variation of force and a greater control of tooth movement by decreasing the gap between brackets and archwire.[12]

Comparing the correction of two different malocclusions (like Class I and Class II malocclusions), it is noticed that there is a difference in required amount of movement and the type of movement to correct anteroposterior relationship. Both malocclusions can be treated with several protocols, one extremely accept protocol for both malocclusions is the treatment with extractions and it is known treatment with extractions are associated with more severe root resorption.[9,10,26,27]

Many studies have already shown that the most commonly affected teeth in root resorption are the maxillary incisors followed by mandibular incisors and they also showed that the horizontal displacement of tooth during orthodontic treatment is positively associated with the shortening of the incisor root, especially in patients treated with extractions.[9,11,13,15,18,26,28,29]

It has been speculated that orthodontic treatment which uses thicker stainless steel archwires could show greater root resorption at the end of the treatment when compared to orthodontic treatment with thinner stainless steel archwires [20]. There is a clinical importance to knowing the effects of treatments performed with different calibers of rectangular steel archwires in root resorption since, if similar, the clinician can choose the better option for each patient. Therefore, the objective of this study was to compare the apical root resorption in patients with different malocclusions treated with 0.021x0.025 inch archwire in anterior retraction with those treated with 0.019x0.025 or 0.018x0.025 inch archwire in anterior retraction.

2 ARTICLES

2 ARTICLES

2.1 ARTICLE 1 - Comparison of apical root resorption with the 70´s decade mechanics x contemporary mechanics

2.2 ARTICLE 2 - Does the sagittal discrepancy influence root resorption degree after orthodontic treatment?

2.1 ARTICLE 1

COMPARISON OF APICAL ROOT RESORPTION WITH THE 70´S DECADE MECHANICS X CONTEMPORARY MECHANICS

Abstract

Introduction: The objective of this study was to compare the apical root resorption in patients treated with 0.021x0.025 inch archwire in anterior retraction with those who were treated with 0.019x0.025 or 0.018x0.025 inch archwire in anterior retraction. **Methods:** A sample of 92 patients treated with four premolar extractions was divided into two groups. Group 1 (G1) consisted of 46 patients who were treated with 0.021x0.025 inch archwire in anterior retraction after four premolar extraction. Group 2 (G2) consisted of 46 patients who were treated with 0.019x0.025 or 0.018x0.025 inch archwire in anterior retraction after four premolar extraction. The groups were matched regarding initial age, treatment time, sex distribution, initial crowding and initial malocclusion severity with PAR index. Pre- and posttreatment lateral cephalometric and periapical radiographs were evaluated. Mann Whitney and t tests were performed to compare the initial status, the treatment changes and the quantity of resorption of the groups. **Results:** There was a greater extrusion of maxillary incisors in group 1. The apical root resorption was greater in group 1 both in maxillary and mandibular incisors. **Conclusion:** The thickness of the archwire is an important factor in root resorption in the orthodontic treatment.

Keywords: root resorption; extractions; anterior retraction

INTRODUCTION

External apical root resorption is a well-known consequence of orthodontic treatment. It is characterized by a shortening of the root and occurs more noticeably only in some patients, since apical root resorption presents a multifactorial cause.[1]

The concentration of orthodontic forces on the root, especially on the apex, can cause biological changes in the cementum and periodontal ligament, resulting in root resorption.[2,3]The quantity of orthodontic force absorbed by the tooth[3-5], the type of treatment,[6-9] duration of treatment,[3,6,10-13] genotype[6,14,15] and age of the patient[6,13,16,17] are considered potentially contributing factors of root resorption.

Among dental movements, incisor intrusion and anterior retraction seem to cause the greatest root resorption during orthodontic treatment.[10,18,19] Besides, in the orthodontic mechanics some variables, like the use of fixed appliances,[20,21] the torque,[18] the use of rectangular stainless steel archwires[17,21,22] and the magnitude of the applied force[17] are related to root resorption.

It has been speculated that orthodontic treatment which uses thicker stainless steel archwires could show greater root resorption at the end of the treatment when compared to orthodontic treatment with thinner stainless steel archwires. [17] There is a clinical importance to knowing the effects of treatments performed with different calibers of rectangular steel archwires in root resorption since, if similar, the clinician can choose the better option for each patient. Therefore, the objective of this study was to compare the apical root resorption in patients treated with 0.021x0.025 inch archwire in anterior retraction with those who were treated with 0.019x0.025 or 0.018x0.025 inch archwire in anterior retraction.

MATERIAL AND METHODS

Material

This study was approved by the Ethics in Research Committee of Bauru Dental School, University of São Paulo, under protocol number 28921720600005417.

The sample was selected from the files of the Orthodontic Department at Bauru Dental School. The primary selection criteria consisted of patients with bilateral Class I or Class II pretreatment malocclusion, treated with four premolars extractions at Bauru Dental School with complete orthodontic records with good quality including pretreatment and posttreatment dental casts, periapical radiographs and lateral headfilms. The additional selection criteria was: (1) no history of facial trauma that could have altered growth of the apical bases, (2) no history of tooth agenesis or supranumerary teeth, and (3) patients treated with conventional or preadjusted edgewise appliance. To select the sample, only the initial anteroposterior relationship was considered. No other dentoalveolar or skeletal characteristic was taken into consideration.

The sample was divided in two groups, according to the type of stainless steel archwire used to anterior retraction. Group 1 consisted of 46 patients who were treated with 0.021x0.025 inch archwire in anterior retraction after four premolar extraction.

Group 2 (G2) consisted of 46 patients who were treated with 0.019x0.025 or 0.018x0.025 inch archwire in anterior retraction after four premolar extraction.

To detect a minimum difference of 0.5 in root resorption degree, with a standard deviation of 0.59, with a significance level of 0.05 and 80% of test power, sample size calculation demonstrated that 23 patients were needed in each group (de Freitas et al., 2007). Therefore, group 1 consisted of 46 patients with Class I or Class II malocclusion treated with 0.021x0.025 inch archwire in anterior retraction after four premolar extraction with an initial mean age of 13.65 years and with a treatment time of 28.7 months. group 2 consisted of 46 patients with Class I or Class II malocclusion treated with 0.019x0.025 or 0.018x0.025 inch archwire in anterior retraction after four premolar extraction, with an initial mean age of 13.88 years and with 32.07 months of treatment time.

Methods

Assessment of initial characteristics and treatment of patients

The initial crowding was measured in maxillary and mandibular arches using Little's Irregularity Index, which involves the determination of the linear displacement of the adjacent anatomical contact points of the incisors. The sum of the measurements represents the irregularity index of each case.[23-25]

Initial malocclusion severity was evaluated on initial dental casts using the PAR (Peer Assessment Rating) index.[26]

Cephalometric assessment of quantity of movement

The pretreatment and posttreatment lateral cephalograms were scanned to allow the acquisition of images by Dolphin® Imaging 11.5 (Patterson Dental Supply, Inc., Chatsworth, CA). The magnification factors of the radiographic images which varied from 6% to 9.8% were corrected by the cephalometric software depending on which machine had been used. Landmark identifications were performed on the software by 1 investigator (RSP) (Table I).

Evaluation of the degree of root resorption

To classify the severity of resorption in the roots of the maxillary and mandibular incisors during anterior retraction, pretreatment periapical radiographs were taken as a parameter. To minimize the standardization problem between the periapical radiographs, the scoring system proposed by Malmgren et al [13] was used to quantify

root resorption degree instead of metrical evaluation. The classification consists of 5 scores (Fig. 1): 0 - no root resorption; 1- mild resorption, with only an irregular outline and the root showing normal length; 2 - moderate resorption, with little loss of root and the root apex showing an almost straight outline; 3 - sharp resorption, with great root loss, reaching almost a third of its length; and 4 - extreme resorption, with loss greater than a third of the root length.

The initial and final periapical radiographs were scanned using the Sprint Scan 35 Plus Scanner (version 2.7.2, Polaroid, Cambridge, Mass, USA), with a resolution of 675 dpi at a scale of 1:1. The initial radiographs were used as a parameter of the resorption severity during evaluation. The images were analyzed with Photoshop software (Version 6.0, Adobe Systems, San Jose, California, USA) at 300% enlargement, without image quality loss.

The periapical radiographs were randomly encoded with the intention of hiding to which group they belonged (blind evaluation).

Error study

To evaluate measurement errors of the radiographic analysis, 15 posttreatment periapical radiographs were randomly selected and remeasured after 2 weeks. Intra observer agreement was determined by the weighted Cohen kappa (kw) coefficient. Forty-six lateral cephalograms and twenty-three dental casts were randomly selected and then retraced and remeasured by the same examiner (R.S.P.), with a month interval. Random errors were calculated according to Dahlberg's formula [27] ($Se^2= \Sigma d^2/2n$), where S^2 is the error variance and d is the difference between 2 determinations of the same variable. Paired t tests were used to estimate the systematic errors, at $P<0.05$ [28].

Statistical Analyses

Means and standard deviations for each variable were calculated to enable characterization of the groups. Normal distributions were verified by the Shapiro-Wilk test. The results were significant for some variables and Mann-Whitney test were adopted for these variables.

Comparability of the groups regarding the initial age, treatment time and initial crowding were evaluated with Mann-Whitney test. Initial PAR was evaluated with t test and Chi-square test evaluated the sex distribution.

T tests were also used to compare the initial cephalometric characteristics and the intergroup treatment changes. The degree of root resorption was compared with Mann-Whitney test. Results were considered significant at $P<0.05$. All tests were performed with Statistica software (Release 7, StatSoft Inc., Tulsa, OK, USA).

RESULTS

Intraobserver agreement was considered high between the first and second root resorption evaluation ($\kappa = 0.714$ to $k=0.901$).

The random errors were within acceptable limits and ranged from 0.25mm (Overjet) to 0.73mm (Mx1-NA) and from 0.38°(Md1_NB) to 1.57° (Mx1_NA). There were no significant systematic errors**.**

The groups were comparable regarding initial age, treatment time, initial crowding, sex distribution, initial malocclusion severity and initial overbite and overjet. (Table II and Table III). There was a significant difference in initial overjet (Table II).

Group 1 had significantly greater extrusion of maxillary incisors (U1-PP) (Table IV). Root resorption of maxillary and mandibular incisors were significantly greater in group 1 (Table V).

DISCUSSION

The sample was divided according to the archwire gauge used in anterior retraction after four premolar extraction. Orthodontic extraction has been associated with more severe root resorption, but this treatment factor was not relevant in this study because both groups had similar maxillary and mandibular extraction protocols [6,7,29]. Other factors that are also associated with a greater root resorption are the use of rectangular stainless steel archwire and the magnitude of applied force in orthodontic movement [17,21,22].

In this retrospective study it was possible to investigate root resorption in a homogeneous sample with complete records. All patients had pre- and posttreatment periapical radiographs, thus we chose a method for evaluation of root resorption in periapical radiographs. The scoring system proposed by Levander and Malmgren [13] is predominantly used in root resorption studies [8,10,13,16,19,29-31] and therefore they seem to be reliable. Their main advantage is that they do not depend on standardization of the initial radiographs, requiring only similar initial root status of the groups.

At the pretreatment stage the groups were very similar, except by the overjet, ensuring that most likely the different changes produced and the root resorption degree are only the consequence of the different calibers of stainless steel archwires used (Table II).[17,21,22] In order to clarify if the difference in initial overjet was a factor that could influence the root resorption degree, another statistical analysis was performed. Four patients were excluded in each group in order to make the initial overjet of the groups compatible. The results found were the same, a greater root resorption in group 1. (Table VI) Even though this anteroposterior correction would tend to generate a greater movement and consequently a greater root resorption, compatibility of sample related to overjet showed the same result, reinforcing even more that the thickness of the archwire used is associated with root resorption.

Some studies [32,33] have demonstrated that the correction of deep overbite with intrusion movement presents a greater root resorption. Since our sample is comparable in initial overbite (Table II), this factor is eliminated in this investigation.

There was a significantly greater extrusion of the maxillary incisors in G1 (Table IV). This could not be considered a correlated factor to root resorption since other studies showed that intrusion and anterior retraction are the dental movements that cause greatest resorption [29,34,35]. In addition to that, the treatment of patients with open bite showed no statistically significant difference in root resorption degree when compared with the treatment of normal overbite patients [36]. This demonstrates that the treatment with extrusion movement cannot be considered a factor for greater root resorption.

Root resorption was significantly greater in group 1 (Table V). This group was treated with a larger stainless steel archwire in anterior retraction after four premolar extraction. This result may be explained by the forces applied in each group, the greater archwire cross-section used in anterior retraction, the greater friction and the force applied in the same movement [37,38]. These results corroborate other studies [17,21,22] that showed an association between the magnitude of applied force and root resorption.

This investigation focused solely in periapical radiographs of maxillary and mandibular incisors to evaluate root resorption since studies [39-41] demonstrated that the most commonly affected teeth in root resorption are the maxillary incisors, followed by mandibular incisors. Our results are in agreement with this statement since we found a greater mean of maxillary incisors root resorption compared with mandibular

incisors root resorption (Table V). The only tooth that did not present a considerable difference in resorption between the groups was the right mandibular lateral incisor (Table V), even though it presented a moderate mean resorption.

In the 70th decade it was believed to be necessary to use an appliance with a 0.22 slot and fill it with a larger cross-section stainless steel archwire, so that there was a minimum clearance into slot and this way the torque could be maximum expressed. [42] In contemporary mechanics, it has been observed that there is no need for such a large cross-section stainless steel archwire since the full expression of the torque is not necessary in most cases.[10] In those cases where this torque expression is necessary it could be compensated by greater torque in archwire. Thus it is much more common to use smaller cross-section archwire that could slide freely in orthodontic movement. This movement with minor friction applies a minor force and it causes minors biological damages. This corroborates our results, which show that greater cross-section archwire results in greater root resorption observed in orthodontic treatment.

CONCLUSIONS:

- Greater stainless steel rectangular archwire thickness produces more root resorption than thinner rectangular archwires.

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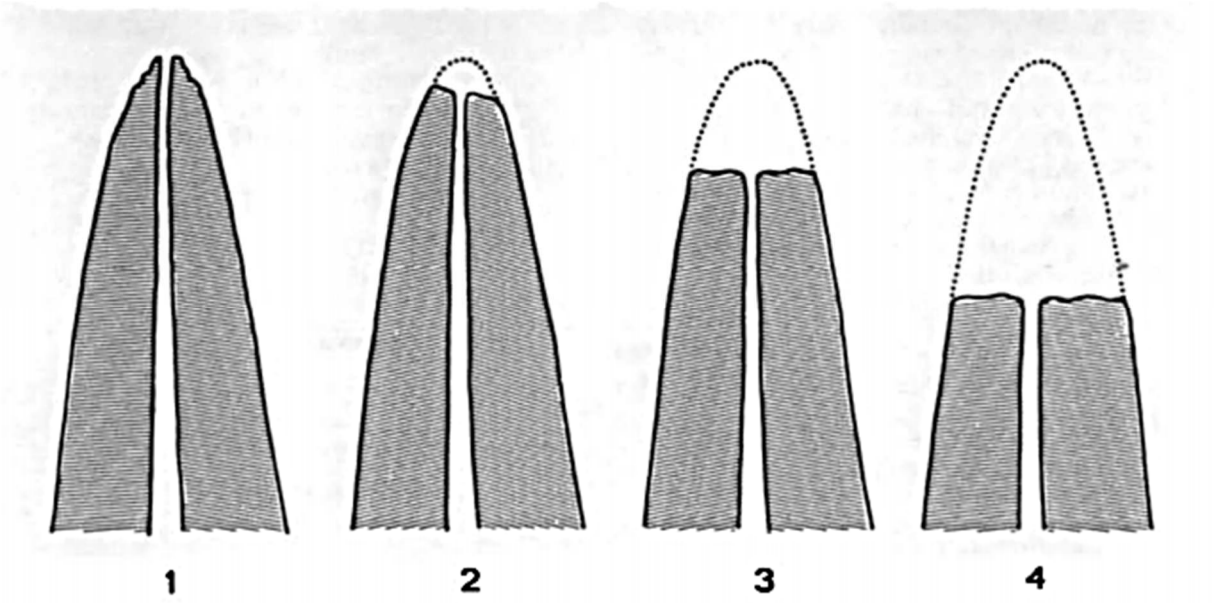

Fig. 1: Root resorption index for quantitative assessment of root resorption. 1, Irregular root contour. 2, Root resorption apically, amounting to less than 2 mm. Minor resorption. 3, Root resorption apically, from 2 mm to one third of the original root length. Severe resorption. 4, Root resorption exceeding one third of the original root length. Extreme resorption.

Table I – Variables assessed in this study.

Maxillary dentoalveolar components	
Mx1.NA	Maxillary incisor long axis to NA angle
Mx1-NA	Distance between most anterior point of crown of maxillary incisor and NA line
Mx1-PP	Perpendicular distance between incisal edge of maxillary incisor and palatal plane
Mandibular dentoalveolar components	
Md1.NB	Mandibular incisor long axis to NB angle
Md1-NB	Distance between most anterior point of crown of mandibular incisor and NB line
Md1 -MP	Distance between mandibular incisal edge and mandibular plane
Dental relationship	
Overjet	Distance between incisal edges of maxillary and mandibular central incisors, parallel to occlusal plane
Overbite	Distance between incisal edges of maxillary and mandibular central incisors, perpendicular to occlusal plane

Table II – Intergroup pretreatment comparisons.

Variable	**Group 1 (n=46)**			**Group 2 (n=46)**			
	mean	median	SD	mean	median	SD	P
Initial age (years)	13.658	13.080	1.883	13.883	13.75	1.178	0.084 $^{\lambda}$
Treatment time (months)	28.70	27.00	9.235	32.07	31.0	10.88	0.131 $^{\lambda}$
Mx Initial crowding (mm)	7.630	6.650	4.30	7.591	7.39	4.200	0.888 $^{\lambda}$
Md Initial crowding (mm)	6.185	5.250	3.842	5.80	5.74	2.524	0.842 $^{\lambda}$
PARI	24	26	8.206	20.7	19.5	9.048	0.070
Overjet (T1) (mm)	6.232	5.3	2.907	4.756	3.750	2.694	0.003 $^{\lambda}$ *
Overbite (T1) (mm)	1.947	1.900	1.852	1.469	1.30	1.964	0.203 $^{\lambda}$

*Statistically significant at $P<0.05$
PARI – Initial severity of malocclusion assessed with PAR index
$^{\lambda}$ Nonparametric Mann-Whitney test

Table III – Intergroup comparisons of sex distribution (Chi-square test).

Sex	**Group 1 (n=46)**		**Group 2 (n=46)**	
	n	%	n	%
Female	21	45.6	29	63
Male	25	54.4	17	37
			P= 0.094	

Statistically significant at *P*<0.05

Table IV – Intergroup comparisons of treatment changes.

Variable	Group 1 (n=46)			Group 2 (n=46)			
	mean	median	SD	mean	median	SD	p
Overjet (T2 - T1) (mm)	-3.4174	-2.70	2,776	-1.645	-1.450	2.586	0.001 $^{\lambda}$ *
Overbite (T2-T1) (mm)	-0.5087	-0.90	1,828	-0.2130	-0.150	1.580	0.409
Mx1-NA (T2-T1) (mm)	-3.1217	-2.850	3,145	-2.352	-1.90	3.129	0.243
Mx1.NA (T2-T1) (°)	-6,180	-4,450	9,321	-4.167	-3.800	8.604	0.285
Mx1- PP (T2-T1) (mm)	1,187	0.80	1,79	0.002	-0.150	1.769	0.002*
Md1-NB (T2-T1) (mm)	-1,597	-1,650	1,689	-1.913	-1.850	1.778	0.386
Md1.NB (T2-T1) (°)	-3.087	-2,950	5,299	-4.1957	-3.650	4.666	0.290
Md1-MP (T2-T1) (mm)	0.5196	0.850	1,875	-0.18	-0.150	1.839	0.074 $^{\lambda}$

*Statistically significant at $P<0.05$
$^{\lambda}$ Nonparametric Mann-Whitney test

Table V – Intergroup root resorption comparison (Mann-Whitney test).

Variable	Group 1 (n=46)			Group 2 (n=46)			
	mean	median	SD	mean	median	SD	p
Mx2R	2,39	2.0	0.930	1.85	2	0.815	0.005*
Mx1R	2.54	2.5	0.887	1.76	2	0.639	<0.001*
Mx1L	2.39	2	0.930	1.74	2	0.612	<0.001*
Mx2L	2.5	3	0.863	1.87	2	0.653	<0.001*
Mean superior resorption	2.445	2,5	0.816	1.785	1.875	0.583	<0.001*
Md2R	2.00	2.00	0.730	1.74	2	0.575	0.077
Md1R	2.13	2	0.687	1.65	2	0.640	0.001*
Md1L	2.09	2	0.725	1.61	2	0.649	0.002*
Md1L	2.11	2	0.674	1.7	2	0.591	0.003*
Mean inferior resorption	2.081	2	0.630	1.695	1.75	0.521	0.003*

*Statistically significant at $P<0.05$

Table VI – Intergroup root resorption comparison with overjet comparable (Mann-Whitney test).

Variable	Group 1 (n=42)			Group 2 (n=42)			P
	Mean	Median	SD	Mean	Median	SD	
Initial age(y)	13.64	13.08	1.87	13.90	13.75	1.15	0.057
Treatment time (m)	28.38	26.50	9.22	31.98	31.00	11.18	0.143
Initial Overjet	5.65	5.20	2.28	5.00	4.20	2.67	0.053
Mx2R	2.38	2.00	0.96	1.83	2.00	0.79	0.007*
Mx1R	2.48	2.00	0.86	1.76	2.00	0.65	<0.001*
Mx1L	2.36	2.00	0.87	1.76	2.00	0.61	0.001*
Mx2L	2.45	2.00	0.88	1.81	2.00	0.63	0.001*
Mean resorption sup	2.40	2.50	0.81	1.76	1.87	0.59	<0.001*
Md2R	1.93	2.00	0.71	1.76	2.00	0.57	0.285
Md1R	2.10	2.00	0.69	1.64	2.00	0.65	0.003*
Md1L	2.07	2.00	0.74	1.60	1.50	0.66	0.003*
Md1R	2.05	2.00	0.66	1.71	2.00	0.59	0.020*
Mean resorption inf	2.03	2.00	0.63	1.70	1.75	0.53	0.013*

*Statistically significant at $P<0.05$

2.2 ARTICLE 2

Does the sagittal discrepancy influence root resorption degree after orthodontic treatment?

Abstract

Introduction: The objective of this study was to compare the apical root resorption in patients treated with rectangular stainless steel archwire in anterior retraction with Class I malocclusion with Class II malocclusion. **Methods:** A sample of 110 patients treated with four premolar extractions was divided into two groups. Group 1 (G1) consisted of 57 patients with Class I malocclusion treated with rectangular archwire in anterior retraction after four premolar extractions. Group 2 (G2) consisted of 53 patients with Class II malocclusion treated with rectangular archwire in anterior retraction after four premolar extractions. The groups were matched regarding initial age, treatment time and sex distribution. Pre- and posttreatment lateral cephalometric and periapical radiographs were evaluated. Mann Whitney and t tests were performed to compare the initial status, the treatment changes and the quantity of resorption of the groups. **Results:** The maxillary incisors presented a significantly greater palatal tipping, retrusion and extrusion and mandibular incisors experienced a greater intrusion in group 2 than in group 1. There was no statistically significant difference in apical root resorption between the groups. **Conclusion:** Despite the differences in initial malocclusion, there was no difference in root resorption degree after orthodontic treatment, what led us to search for other causes to associate with root resorption.

Keywords: root resorption; Class I malocclusion; Class II malocclusion

INTRODUCTION

Apical root resorption represents a frequent biological cost of tooth movement induced, with variable and unpredictable magnitude.[1,2] In most cases, root resorption resulting from orthodontic movement is minimal and it has no clinical significance, since it reaches mean values of 0.5 to 3 mm of root shortening.[3,4]

The concern with dental resorption within Orthodontics begun in 1914 with Ottolengui[5] who was the first to raise the hypothesis of a possible relationship of root resorption and orthodontic movement. But it was proved radiographically only in 1927 by Ketcham.[6] In subsequent years, numerous studies about dental resorption were developed searching possible causes to associate root resorption and orthodontic treatment. The studies converged to the fact that occurrence and magnitude of root resorption have low predictability and great individual variation and may be influenced by several factors like general factors (genetics, age), local factors (previous presence of trauma, associated habits, shape of roots) and mechanical factors (magnitude of the force, duration of the force, interval of application of force, type of movement, amount of movement).[7-21]

Many studies have already shown that the most commonly affected teeth in root resorption are the maxillary incisors followed by mandibular incisors and they also showed that the horizontal displacement of tooth during orthodontic treatment is positively associated with the shortening of the incisor root, especially in patients treated with extractions.[10,12,14,16,19,22-24]

Comparing the correction of two different malocclusions (like Class I and Class II malocclusions) it is noticed that there is a difference in required amount of movement and the type of movement to correct anteroposterior relationship. Both malocclusions can be treated with extractions and it is known treatment with extractions is associated with more severe root resorption.[10,11,24,25] Therefore, the objective of this study was to compare the root resorption in different types of malocclusion (Class I and Class II) treated with different rectangular cross-section stainless steel archwire in anterior retraction after four premolar extractions.

MATERIAL AND METHODS

Material

This study was approved by the Ethics in Research Committee of Bauru Dental School, University of São Paulo, under protocol number 28921720600005417.

The sample was selected from the files of the Orthodontic Department at Bauru Dental School. The primary selection criteria consisted of patients with bilateral Class I or Class II pretreatment malocclusion, treated with four premolars extractions at Bauru Dental School with complete orthodontic records with good quality including pretreatment and posttreatment dental casts, periapical radiographs and lateral

headfilms. The additional selection criteria was: (1) no history of facial trauma that could have altered growth of the apical bases, (2) no history of tooth agenesis or supranumerary teeth, and (3) patients treated with conventional or preadjusted edgewise appliance. To select the sample, only the initial anteroposterior relationship was considered. No other dentoalveolar or skeletal characteristic was taken into consideration.

The sample was divided in two groups, according to the type of initial malocclusion. Group 1 consisted of 57 Class I malocclusion patients treated with 0.021x0.025 or 0.019x0.025 or 0.018x0.025 inch archwire in anterior retraction after four premolar extractions. Group 2 (G2) consisted of 53 Class II malocclusion patients treated with 0.021x0.025 or 0.019x0.025 or 0.018x0.025 inch archwire in anterior retraction after four premolar extractions.

To detect a minimum difference of 0.5 in root resorption degree, with a standard deviation of 0.59, with a significance level of 0.05 and 80% of test power, sample size calculation demonstrated that 23 patients were needed in each group.[25]Therefore, the group 1 consisted of 57 patients with Class I or Class II malocclusion treated with rectangular archwire in anterior retraction with an initial mean age of 13.89 years and with a treatment time of 29.09 months. The group 2 consisted of 53 patients with Class I or Class II malocclusion treated with rectangular archwire in anterior retraction, with an initial mean age of 13.49 years and with 30.81 months of treatment time.

Methods

Assessment of initial characteristics and treatment of patients

The initial crowding was measured in maxillary and mandibular arches using the Little's Irregularity index, which involves the determination of the linear displacement of the adjacent anatomical contact points of the incisors. The sum of the measurements represents the irregularity index of each case. [26-28]

Initial malocclusion severity was evaluated on initial dental casts using the PAR (Peer Assessment Rating) index.[29]

Cephalometric assessment of quantity of movement

The pretreatment and posttreatment lateral cephalograms were scanned to allow the acquisition of images by Dolphin® Imaging 11.5 (Patterson Dental Supply, Inc., Chatsworth, CA). The magnification factors of the radiographic images that varied

from 6% to 9.8% were corrected by the cephalometric software depending on which machine had been used. Landmark identifications were performed on the software by 1 investigator (RSP). Eight variables were evaluated: Mx1.NA (Maxillary incisor long axis to NA angle); Mx1-NA (Distance between most anterior point of crown of maxillary incisor and NA line); Mx1-PP (Perpendicular distance between incisal edge of maxillary incisor and palatal plane); Md1.NB (Mandibular incisor long axis to NB angle); Md1-NB (Distance between most anterior point of crown of mandibular incisor and NB line); Md1-MP (Distance between mandibular incisal edge and mandibular plane); Overjet (Distance between incisal edges of maxillary and mandibular central incisors, parallel to occlusal plane); Overbite (Distance between incisal edges of maxillary and mandibular central incisors, perpendicular to occlusal plane).

Evaluation of the degree of root resorption

To classify the severity of resorption in the roots of the maxillary and mandibular incisors during anterior retraction, pretreatment periapical radiographs were taken as a parameter (Fig XX) To minimize the standardization problem between the periapical radiographs, the scoring system proposed by Levander and Malmgren[17] was used to quantify root resorption degree instead of metrical evaluation. The classification consists of 5 scores (Fig 2): 0, no root resorption; 1, mild resorption, with only an irregular outline and the root showing normal length; 2, moderate resorption, with little loss of root and the root apex showing an almost straight outline; 3, sharp resorption, with great root loss, reaching almost a third of its length; and 4, extreme resorption, with loss greater than a third of the root length.

The initial and final periapical radiographs were scanned with the Sprint Scan 35 Plus Scanner (version 2.7.2, Polaroid, Cambridge, Mass, USA), with a resolution of 675 dpi at a scale of 1:1. The initial radiographs were used as a parameter of the resorption severity during evaluation. The images were analyzed with Photoshop software (Version 6.0, Adobe Systems, San Jose, California, USA) at 300% enlargement, without image quality loss.

The periapical radiographs were randomly encoded with the intention of hiding of which group they belong (blind evaluation).

Error study

Method error was computed by retracing pairs (pre- and posttreatment) of lateral cephalograms 1 month after initial scanning and tracing on 28 randomly chosen cases by the same examiner (R.S.P). To evaluate measurement errors of the radiographic analysis, 28 posttreatment periapical radiographs were randomly selected and remeasured after 1 month interval. Intra observer agreement was determined by the weighted Cohen kappa (kw) coefficient. Random errors were calculated according to Dahlberg's formula[30] ($Se^2 = \Sigma d^2/2n$), where S^2 is the error variance and d is the difference between 2 determinations of the same variable. Paired t tests were used to estimate the systematic errors, at $P<0.05$.[31]

Statistical Analyses

Means and standard deviations for each variable were calculated to enable characterization of the groups. Normal distributions were verified by the Shapiro-Wilk test. The results were significant for some variables and Mann-Whitney test were adopt for these variables.

Comparability of the groups regarding the initial age, treatment time and initial crowding were evaluated with Mann-Whitney test. Initial PAR was evaluated with t test and Chi-square test evaluated the sex distribution.

T tests were also used to compare the initial cephalometric characteristics and the intergroup treatment changes. The degree of root resorption was compared with Mann-Whitney test. Results were considered significant at $P<0.05$. All tests were performed with Statistica software (Release 7, StatSoft Inc., Tulsa, OK, USA).

RESULTS

Kappa statistics showed almost perfect agreement between the first and second root resorption evaluation ($\kappa = 0.736$ to $\kappa = 0.908$).

The random errors ranged from 0.24mm (Overjet) to 0.58mm (Mx1-PP) and from 0.47° (Mx1.NA) to 1.18° (Md1.NB). There were no significant systematic errors**.**

The groups were comparable regarding initial age, treatment time and sex distribution(Tables I). The distribution of the cross-section of rectangular stainless steel archwire used in anterior retraction was also comparable (Table I).

The maxillary incisors presented greater palatal tipping, retrusion and extrusion and mandibular incisors experienced a greater intrusion in group 2 than in group 1.

There were no statistically significant difference in apical root resorption between the groups.

DISCUSSION

The sample was divided according the type of malocclusion (Class I or Class II malocclusion). Any type of malocclusion is susceptible to root resorption[14,19,32-34] Thus, there is no prediction of root resorption based on the type of malocclusion. It is more logical to believe in the correlation between the severity of malocclusion and root resorption, as a result of required mechanical resources and the amount and type of movement to be performed.

Treatments that involve a wide range of dental movements in order to camouflage larger skeletal discrepancies are more predisposed to root resorption due to the biological limits imposed by malocclusion.[35] Among dental movements, incisor intrusion and anterior retraction seem to cause the greatest root resorption during orthodontic treatment.[14,32,36] Orthodontic extraction has been associated with more severe root resorption, but this treatment factor was not relevant in this study because both groups had similar maxillary and mandibular extraction protocols.[10,11,24]

Both groups were treated with 0.021x0.025 or 0.019x0.025 or 0.018x0.025 inch archwire in anterior retraction after four premolar extraction and the distribution of the cross-section archwire are similar in both groups (Table I)

At the pretreatment stage the groups presents differences in overjet, overbite and initial crowding (Table I) since they are different malocclusion and this study pretended to evaluate if this differences influence in root resorption, that is a positive data. During treatment, the maxillary incisors presented significantly greater palatal tipping, retrusion and extrusion in group 2 than in the group 1 (Table II) These results corroborate the literature[37-39] of treatment of Class II malocclusion with different types of treatment. Mandibular incisors experienced a significantly greater intrusion in group 2 than in the group 1 (Table II). This result can probably be explained by the necessity of correction of curve of Spee that is more frequent in Class II malocclusion.[40]

Although this study found significant differences in treatment changes between the groups, there were no statistically significant differences in apical root resorption between the groups (Table III). In order to clarify if the difference in initial characteristics were a factor that could influence the root resorption degree, another statistical analysis was performed. Some patients were excluded in each group for the purpose

of matching the initial characteristics of the groups in both types of malocclusions. The results found were the same, no significantly difference in root resorption between groups. (Table IV and V)

Some differences found in treatment changes like mandibular incisors intrusion and palatal tipping and retrusion of maxillary incisors are types of movement described in literature that have association with root resorption[14,32,33,36] but the results in our study do not show this association with root resorption.

Therefore our results demonstrate that the type of malocclusion and the initial discrepancies between groups are not associated with root resorption degree. Probably the type and magnitude of applied force and the archwire cross-section can be factors with greater association with root resorption degree.

CONCLUSIONS:

- Class I and Class II malocclusions treated with 4-premolar extractions present similar degrees of root resorption. Therefore, correction of the sagittal discrepancy is not associated with a greater degree of resorption.

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Table I – Intergroup pretreatment comparisons.

Variable	**Group 1 (n=57)**			**Group 2 (n=53)**			
	mean	median	SD	mean	median	SD	**P**
Initial age (years)	13.89	13.67	1.93	13.49	13.33	1.26	0.386
Treatment time (months)	29.09	26.00	11.57	30.81	28.00	12.20	0.295
Mx Initial crowding (mm)	7.42	6.98	4.40	7.43	7.09	3.57	0.689
Md Initial crowding (mm)	6.69	5.95	3.40	5.13	5.25	2.57	0.024*
PARI	18.56	18.00	7.78	26.09	27.00	7.91	<0.001*
Overjet (T1) (mm)	4.26	4.00	1.83	6.63	6.00	3.18	<0.001*
Overbite (T1) (mm)	1.31	1.50	1.79	2.15	1.90	2.05	0.023[t]
Sex (n) Female		34 (59.6%)			27 (50.9%)		0.359[€]
Male		23 (40.4%)			26 (49.1%)		
Archwire 0.019x0.025		27 (47.4%)			25 (47.2%)		0.983[€]
0.021x0.025		30 (52.6%)			28 (52.8%)		

P<0.05; [€] Chi-square; [t] t-test
PARI – Initial severity of malocclusion assessed with PAR index
*Statistically significant at *P*<0.05

Table II – Intergroup comparisons of treatment changes.

Variable	**Group 1 (n=57)**			**Group 2 (n=53)**			
	mean	median	SD	mean	median	SD	**P**
Overjet (T2 - T1) (mm)	-1.56	-1.40	1.84	-3.44	-3.00	3.28	<0.001 $^{\lambda}$ *
Overbite (T2-T1) (mm)	-0.17	-0.20	1.68	-0.55	-0.70	1.97	0.438 $^{\lambda}$
Mx1-NA (T2-T1) (mm)	-1.90	-1.80	2.32	-3.26	-2.80	3.56	0.021^{t}*
Mx1.NA (T2-T1) (°)	-2.68	-2.20	7.13	-6.73	-5.30	9.70	0.015 ^{t}
Mx1- PP (T2-T1) (mm)	0.07	0.00	1.51	0.93	0.90	2.04	0.014^{t}
Md1-NB (T2-T1) (mm)	-1.84	-1.80	1.84	-1.73	-1.90	1.72	0.748^{t}
Md1.NB (T2-T1) (°)	-4.44	-4.30	5.08	-3.20	-2.80	4.73	0.190^{t}
Md1-MP (T2-T1) (mm)	0.58	0.90	1.71	-0.12	0.00	1.93	0.044^{t}

*Statistically significant at *P*<0.05
^{t} t-test; $^{\lambda}$ Nonparametric Mann-Whitney test

Table III - Intergroup root resorption comparison (Mann-Whitney test)

Variable	**Group 1 (n=57)**			**Group 2 (n=53)**			
	mean	median	SD	mean	median	SD	**P**
Mx2R	2.04	2.00	0.96	2.30	2.00	0.93	0.186
Mx1R	2.04	2.00	0.75	2.36	2.00	0.94	0.090
Mx1L	1.96	2.00	0.77	2.23	2.00	0.86	0.138
Mx2L	2.11	2.00	0.77	2.32	2.00	0.85	0.231
Mean superior resorption	2.03	2.00	0.68	2.27	2.00	0.83	0.193
Md2R	1.89	2.00	0.69	1.91	2.00	0.68	0.927
Md1R	1.93	2.00	0.65	1.91	2.00	0.71	0.825
Md1L	1.91	2.00	0.71	1.85	2.00	0.69	0.591
Md1L	1.88	2.00	0.68	2.00	2.00	0.67	0.343
Mean inferior resorption	1.91	2.00	0.59	1.92	2.00	0.62	0.825

*Statistically significant at $P<0.05$

Table IV – Intergroup pretreatment comparisons (Compatible initial stage).

Variable	**Group 1 (n=42)**			**Group 2 (n=42)**			
	mean	median	SD	mean	median	SD	**P**
Initial age (years)	14.01	13.71	1.89	13.57	13.33	1.32	0.334
Treatment time (months)	28.36	25.5	10.85	29.76	26.50	12.74	0.619
Mx Initial crowding (mm)	7.98	7.18	4.74	7.17	6.76	3.65	0.534
Md Initial crowding (mm)	6.66	5.77	3.69	5.12	4.56	2.79	0.094
PARI	21.59	19.50	6.58	23.31	25	6.15	0.094
Overjet (T1) (mm)	4.52	4.10	1.90	6.23	5.45	3.06	0.012*
Overbite (T1) (mm)	1.54	1.80	1.87	2.07	2.00	1.91	0.198 [t]
Sex (n) Female	24 (57.1%)			25 (59.5%)			0.825[€]
Male	18 (42.9%)			17 (40.5%)			

P<0.05; [€] Chi-square; [t] t-test
*Statistically significant at *P*<0.05

Table V: Intergroup root resorption comparison in groups with compatible initial stage(Mann-Whitney test)

Variable	**Group 1 (n=42)**			**Group 2 (n=42)**			
	mean	median	SD	mean	median	SD	P
Mx2R	2.17	2.00	0.853	2.36	2.00	0.932	0.465
Mx1R	2.17	2.00	0.762	2.33	2.00	0.954	0.517
Mx1L	2.14	2.00	0.751	2.21	2.00	0.871	0.762
Mx2L	2.24	2.00	0.790	2.36	2.00	0.850	0.629
Mean superior resorption	2.19	2.12	0.678	2.27	2.00	0.846	0.783
Md2R	1.86	2.00	0.718	1.93	2.00	0.712	0.641
Md1R	1.95	2.00	0.623	1.90	2.00	0.726	0.713
Md1L	1.95	2.00	0.697	1.83	2.00	0.696	0.368
Md1L	1.88	2.00	0.739	2.00	2.00	0.698	0.437
Mean inferior resorption	1.92	2.00	0.603	1.91	2.00	0.640	0.927

*Statistically significant at $P<0.05$

3 DISCUSSION

3 DISCUSSION

Orthodontic extraction has been associated with more severe root resorption, but this treatment factor was not relevant in this study because both groups had similar maxillary and mandibular extraction protocols [9,10,26]. Other factors that are also associated with a greater root resorption are the use of rectangular stainless steel archwire and the magnitude of applied force in orthodontic movement [20,24,25], so one sample was divided according to the archwire gauge used in anterior retraction after four premolar extraction.

The other sample was divided according the type of malocclusion (Class I or Class II malocclusion), both groups treated with rectangular archwire in anterior retraction after four premolar extractions. Any type of malocclusion is susceptible to root resorption[13,18,22,30,31] Thus, there is no prediction of root resorption based on the type of malocclusion. It is more logical to believe in the correlation between the severity of malocclusion and root resorption, as a result of required mechanical resources and the amount and type of movement to be performed.

In this retrospective study it was possible to investigate root resorption in a homogeneous sample with complete records. All patients had pre- and posttreatment periapical radiographs, thus we chose a method for evaluation of root resorption in periapical radiographs. The scoring system proposed by Levander and Malmgren [16] is predominantly used in root resorption studies [11,13,16,19,22,26,28,32] and therefore they seem to be reliable. Their main advantage is that they do not depend on standardization of the initial radiographs, requiring only similar initial root status of the groups.

This investigation focused solely in periapical radiographs of maxillary and mandibular incisors to evaluate root resorption since studies [33-35] demonstrated that the most commonly affected teeth in root resorption are the maxillary incisors, followed by mandibular incisors and our results are in agreement with this statement since we found a greater mean of maxillary incisors root resorption compared with mandibular incisors root resorption.

At the first comparison with the sample divided according to the thickness of archwire used in anterior retraction, the only variable that was not comparable at the pretreatment stage was the overjet. In order to clarify if the difference in initial overjet was a factor that could influence the root resorption degree, another statistical analysis was performed and the results obtained were the same, a greater root resorption in the group the used the 0.021x0.025 inch archwire in anterior retraction. Since the groups were very similar at pretreatment, it was ensured that the different changes produced and the root resorption degree are only the consequence of the different calibers of stainless steel archwires used in anterior retraction.[20,24,25] This result may be explained by the forces applied in each group, the greater archwire cross-section used in anterior retraction, the greater friction and the force applied in the same movement [36,37]. These results corroborate other studies [20,24,25] that showed an association between the magnitude of applied force and root resorption.

The second comparison was done focusing on the difference in anteroposterior discrepancy. The sample was divided according to the type of malocclusion (Class I or Class II malocclusion) and both groups were treated with the same extraction protocol and the distribution of different cross-section archwire in each group was comparable. At the pretreatment stage the groups presents differences in overjet, overbite and initial crowding since they have different malocclusion and this study intended to evaluate if these differences influence in root resorption, that is a positive data. During treatment, the maxillary incisors presented significantly greater palatal tipping, retrusion and extrusion in the group with Class II malocclusion. This results corroborates the literature[38-40] of treatment of Class II malocclusion with different types of treatment. Mandibular incisors experienced a significantly greater intrusion in Class II group. This result probably can be explained by the necessity of correction of curve of Spee that is more frequent in Class II malocclusion.[41]

Although this study has found significant differences in treatment changes between the groups, there was no statistically significant difference in apical root resorption between the groups. In order to clarify if the difference in initial characteristics was a factor that could influence the root resorption degree, another statistical analysis was performed. Some patients were excluded in each group for the purpose of matching the initial characteristics of the groups in both types of

malocclusions. The results found were the same, that is, no significant difference in root resorption between groups.

Therefore our results demonstrate that the type of malocclusion and the initial discrepancies between groups are not associated with root resorption degree. These results reinforce that the type and magnitude of applied force and the archwire cross-section can be factors with greater association with root resorption degree, as founded in first comparison.

4 CONCLUSIONS

4 CONCLUSIONS

- Greater stainless steel rectangular archwire thickness produces more root resorption than thinner rectangular archwires.
- Class I and Class II malocclusions treated with 4-premolar extractions present similar degrees of root resorption. Therefore, correction of the sagittal discrepancy is not associated with a greater degree of resorption.

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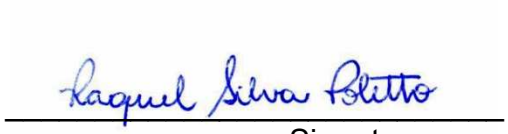
41. Sayar G, Oktay H. Assessment of curve of spee in different malocclusions. Eur Oral Res 2018;52:127-130.

APPENDICES

APPENDIX A - DECLARATION OF EXCLUSIVE USE OF THE ARTICLE IN DISSERTATION/THESIS

We hereby declare that we are aware of the article “Comparison of apical root resorption with the 70’s decade mechanics X contemporary mechanics” will be included in Thesis of the student Raquel Silva Poletto and may not be used in other works of Graduate Programs at the Bauru School of Dentistry, University of São Paulo.

Bauru, March 03rd, 2020.

Raquel Silva Poletto	
Author	Signature
Guilherme Janson	
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APPENDIX B - DECLARATION OF EXCLUSIVE USE OF THE ARTICLE IN DISSERTATION/THESIS

We hereby declare that we are aware of the article “Does the sagittal discrepancy influence root resorption degree after orthodontic treatment?” will be included in Thesis of the student Raquel Silva Poletto and may not be used in other works of Graduate Programs at the Bauru School of Dentistry, University of São Paulo.

Bauru, March 03rd, 2020.

Raquel Silva Poletto	
Author	Signature
Guilherme Janson	
Author	Signature
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Author	Signature

ANNEXES

USP - FACULDADE DE ODONTOLOGIA DE BAURU DA USP

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: COMPARAÇÃO DA REABSORÇÃO RADICULAR COM A MECÂNICA DA DÉCADA DE 1970 x A MECÂNICA CONTEMPORÂNEA

Pesquisador: Raquel Silva Poletto

Área Temática:

Versão: 1

CAAE: 28921720.6.0000.5417

Instituição Proponente: Universidade de Sao Paulo

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 3.835.247

Apresentação do Projeto:

O estudo irá avaliar a quantidade de reabsorção apical externa em pacientes Classe I e Classe II que foram submetidos à

retração anterior com o fio 0.019" x 0.025" ou 0.018" x 0.025" e compará-los àqueles que foram submetidos à retração anterior com o fio 0.021" x 0.025". A amostra será selecionada do arquivo da Disciplina de Ortodontia da Faculdade de Odontologia de Bauru.

Objetivo da Pesquisa:

Avaliar a quantidade de reabsorção apical externa em pacientes Classe I e Classe II que foram submetidos à retração anterior com o fio 0.019" x 0.025" ou 0.018" x 0.025" compará-los àqueles que foram submetidos à retração anterior com o fio 0.021" x 0.025".

Avaliação dos Riscos e Benefícios:

De acordo com os pesquisadores os riscos focam-se no manuseio do material utilizado, dentre estes riscos estão o desgaste, quebra ou perda de modelos, radiografias e prontuários utilizados. No entanto, todos os cuidados necessários serão tomados para que isso não ocorra.

Como benefícios indiretos, os resultados da pesquisa irão direcionar os ortodontistas qual o melhor calibre de fio a ser utilizado nas retrações anteriores para evitar reabsorções apicais externas nos pacientes Classe I e Classe II.

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USP - FACULDADE DE ODONTOLOGIA DE BAURU DA USP

Continuação do Parecer: 3.835.247

Comentários e Considerações sobre a Pesquisa:

O estudo parece interessante, podendo contribuir com os ortodontistas para um melhor planejamento individual de cada paciente, para atingir com eficácia os objetivos de um tratamento ortodôntico, com menor reabsorção apical externa possível e com melhores resultados e conforto ao paciente.

Considerações sobre os Termos de apresentação obrigatória:

Os termos estão adequados.

De acordo com os pesquisadores, serão revisadas as documentações de prontuários do período entre 1973 e 2003, os quais solicitam assim dispensa de TCLE devido a dificuldade de encontrarem os participantes.

Recomendações:

Não se aplica.

Conclusões ou Pendências e Lista de Inadequações:

Projeto aprovado sem restrições de ordem ética.

Considerações Finais a critério do CEP:

Esse projeto foi considerado APROVADO ad referendum deste CEP, com base nas normas éticas da Resolução CNS 466/12. Ao término da pesquisa o CEP-FOB/USP exige a apresentação de relatório final. Os relatórios parciais deverão estar de acordo com o cronograma e/ou parecer emitido pelo CEP. Alterações na metodologia, título, inclusão ou exclusão de autores, cronograma e quaisquer outras mudanças que sejam significativas deverão ser previamente comunicadas a este CEP sob risco de não aprovação do relatório final. Quando da apresentação deste, deverão ser incluídos todos os TCLEs e/ou termos de doação assinados e rubricados, se pertinentes.

Este parecer foi elaborado baseado nos documentos abaixo relacionados:

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_1334291.pdf	11/02/2020 16:48:24		Aceito
Outros	Checklist_Raquel.pdf	11/02/2020 16:44:08	Raquel Silva Poletto	Aceito
Projeto Detalhado / Brochura Investigador	Projeto_RaquelPoletto.docx	11/02/2020 15:38:29	Raquel Silva Poletto	Aceito
Outros	Termo_uso_arquivo_RPoletto.pdf	17/01/2020 20:57:46	Raquel Silva Poletto	Aceito

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Continuação do Parecer: 3.835.247

Outros	Documento_anexo_dispensaTCLE.pdf	17/01/2020 01:58:16	Raquel Silva Poletto	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	Dispensa_TCLE_e_Termo_Assentimento_Raquel.pdf	17/01/2020 01:57:06	Raquel Silva Poletto	Aceito
Solicitação Assinada pelo Pesquisador Responsável	4_DeclaracaoCompromissoPesquisadorResultadosPesquisa.pdf	17/01/2020 01:53:16	Raquel Silva Poletto	Aceito
Declaração de Instituição e Infraestrutura	Termo_de_Aquiescencia_Raquel.pdf	17/01/2020 01:52:27	Raquel Silva Poletto	Aceito
Folha de Rosto	ROSTO.pdf	17/01/2020 01:29:52	Raquel Silva Poletto	Aceito

Situação do Parecer:
Aprovado

Necessita Apreciação da CONEP:
Não

BAURU, 12 de Fevereiro de 2020

Assinado por:
Ana Lúcia Pompéia Fraga de Almeida
(Coordenador(a))

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