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AVALIAÇÃO TOMOGRÁFICA DOS LIMITES ANATÔMICOS DA SÍNFISE MANDIBULAR EM PACIENTES ADULTOS NÃO-TRATADOS ORTODONTICAMENTE

Santa Maria, RS
2016

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Dissertação apresentada ao Curso de Mestrado do Programa de Pós-Graduação em Ciências Odontológicas, Área de Concentração em Odontologia, ênfase em Ortodontia, da Universidade Federal de Santa Maria (UFSM), como requisito parcial para obtenção do grau de **Mestre em Ciências Odontológicas.**

Orientador: Prof. Dr. Vilmar Antônio Ferrazzo

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Aprovada em 13 de julho de 2016:

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RESUMO

AVALIACÃO TOMOGRÁFICA DOS LIMITES ANATÔMICOS DA SÍNFISE MANDIBULAR EM PACIENTES ADULTOS NÃO-TRATADOS ORTODONTICAMENTE

AUTORA: Paula Guerino
ORIENTADOR: Vilmar Antônio Ferrazzo

O objetivo do estudo foi avaliar os limites ósseos na região dos incisivos inferiores, através da tomografia computadorizada *Cone Beam* (TCCB), e correlacionar com o padrão de crescimento facial, inclinação dos incisivos inferiores, relação anteroposterior entre os maxilares e idade dos pacientes. As imagens tomográficas, de 40 pacientes não tratados ortodonticamente, foram importadas para o programa OsiriX Lite (Pixmeo, Geneva, Switzerland), onde foram realizadas reconstruções multiplanares, obtendo imagem correspondente à telerradiografia lateral, para determinação do padrão facial, através do Índice da Altura Facial (IAF). Além disso, foram feitas reconstruções multiplanares, para obtenção de cortes sagitais da região dos incisivos inferiores. Nestas imagens, foram mensuradas as espessuras ósseas alveolares nas faces vestibular, lingual e total dos incisivos inferiores, além das mensurações de espessura e altura total da sínfise mandibular. As medidas das espessuras ósseas alveolares vestibular, lingual e total foram obtidas à nível de 20, 50, 80 e 100% do comprimento radicular dos incisivos inferiores. Os resultados das medidas ósseas foram correlacionadas (Correlação de Pearson) com o padrão facial, com a inclinação dos incisivos inferiores, com a relação entre os maxilares e com a idade dos pacientes. Observou-se correlações fracas à moderadas entre algumas medidas ósseas com padrão facial, com a inclinação dos incisivos e com a idade do paciente. Não houve associação entre o tipo facial e as espessuras ósseas linguais nos incisivos inferiores, assim como não foi observado associação entre as medidas ósseas e a relação esquelética anteroposterior dos maxilares. Acredita-se que pacientes com tendência à padrão de crescimento dolicofacial apresentam menor espessura do processo alveolar dos incisivos inferiores e maior altura; já pacientes com tendência à padrão de crescimento braquifacial apresentam, com raras exceções, maiores espessuras ósseas vestibular e total à nível de 50, 80 e 100% do comprimento radicular.

Palavras-chave: Imagem Tridimensional. Incisivo. Ortodontia. Processo Alveolar. Tomografia Computadorizada por Raios X.

ABSTRACT

TOMOGRAPHIC EVALUATION OF THE ANATOMICAL LIMITS OF MANDIBULAR SYMPHYSIS IN ORTHODONTICALLY UNTREATED ADULTS

AUTHORS: Paula Guerino
ADVISOR: Vilmar Antônio Ferrazzo

The aim of the study was to evaluate the bone limits in the region of the lower incisors by Cone Beam volume CT (CBCT), and correlate with the pattern of facial growth, with the inclination of the lower incisors, with the skeletal anteroposterior relationship and the age of patients. Tomographic images of 40 patients orthodontically untreated, have been imported into OsiriX Lite program (Pixmeo, Geneva, Switzerland), which were held multiplanar reconstructions, resulting image corresponding to the lateral teleradiography to determine the facial pattern, through the Facial Height Index (FHI). Moreover, multiplanar reconstructions were made to obtain sagittal sections in the region of the lower incisors. These images measured alveolar bone thickness in buccal, lingual, full of the lower incisors, plus the thickness measurements and total height of the mandibular symphysis. Measurements of alveolar bone thickness buccal, lingual and total were obtained at level 20, 50, 80 and 100% of the root length of the lower incisors. The results of bone measurements were correlated (Pearson correlation) with the facial pattern, with the inclination of the lower incisors, with the skeletal anteroposterior relationship and the age of patients. There were observed weak to moderate correlations among some bone measurements with facial pattern, with the inclination of the incisors and the patient's age. There was no association between the pattern of facial growth and the lingual bone thickness in the lower incisors, and was not observed association between bone measurements and skeletal anteroposterior relationship. It is believed that patients with a tendency to long-face have lesser thickness of the alveolar process of the lower incisors and greater height; patients already prone to short-face have, with rare exceptions, higher labial bone thickness and overall the level of 50, 80 and 100% of the root length.

Keywords: Alveolar Process. Imaging, Three-Dimensional. Incisor. Orthodontics. Tomography, X-Ray Computed.

LISTA DE SIGLAS E ABREVIATURAS

AFH	Altura Facial Anterior
PFH	Altura Facial Posterior
CBCT	Cone Beam Computed Tomography
CEP	Comitê de Ética em Pesquisa
cm	centímetros
D	diâmetro
DICOM	Digital Imaging and Communications in Medicine (comunicação de imagens digitais em medicina)
FMA	Frankfurt-Mandibular Plane Angle
FOV	Field Of View (campo de visão)
H	height (altura)
FHI	Índice da Altura Facial
IMPA	Incisor Mandibular Plane Angle
kVp	kilovoltage (quilovoltagem)
mA	miliÂmpere (miliamperagem)
Me	Mentoniano (ponto mais inferior da sínfise mentoniana)
mm	milímetros
MPR	Multiplanar Reconstruction (reconstrução multiplanar)
p	valor de p
r	valor da Correlação de Pearson
s	segundos
S-N.Go-Gn	ângulo entre a linha da sela ao násio e a linha do gônio ao gnation
TCCB	Tomografia Computadorizada *Cone Beam*

SUMÁRIO

1 INTRODUÇÃO

Charles H. Tweed reavaliou criticamente tratamentos ortodônticos executados e observou casos com resultados não satisfatórios, no aspecto da oclusão relacionada com perfil facial. Determinou, através da sua análise cefalométrica, a relação entre o padrão de crescimento facial e o posicionamento anteroposterior dos incisivos inferiores na base óssea. A sua preocupação com a inclinação dos incisivos inferiores associado à falta de espaço para o posicionamento dos dentes no arco foram fundamentais para o desenvolvimento da técnica *Edgewise* associada à exodontia de pré-molares. Assim, o autor determinou que os objetivos da terapia ortodôntica eram, além de obter função adequada, apresentar tecidos bucais condizentes com saúde, manter os dentes em posição estável e verticalizados na sua base óssea e melhorar a estética facial do paciente (TWEED, 1966).

As diretrizes da oclusão desenvolvida por Andrews (ANDREWS, 1972), juntamente com determinados parâmetros funcionais, análises faciais e indicadores ortodônticos, também compuseram um conjunto de informações fundamentais para o planejamento em ortodontia (VALLADARES NETO, 2013; FERES, VASCONCELOS, 2009; ACKERMAN, PROFFIT, 1997; GARIB et al., 2010). Porém, a morfologia da sínfise mandibular e a posição dos incisivos na sínfise são fatores limitantes e de grande importância no diagnóstico e planejamento ortodôntico (TWEED, 1966; GRACCO et al., 2010; HANDELMAN, 1996; NAUERT, BERG, 1999; GARIB et al., 2010).

A posição anteroposterior e as inclinações ideais dos incisivos foram determinadas por diversos autores, como Steiner, Ricketts e Tweed (VILELLA, 2009). Segundo Tweed (1966), a relação do incisivo inferior em relação à sua base óssea é uma guia no diagnóstico e tratamento ortodôntico e, ainda, para obtenção de sucesso na terapia ortodôntica, os incisivos inferiores deveriam estar, ao final do tratamento ortodôntico, verticalizados na sua base óssea.

Dessa forma, a investigação das estruturas ósseas mandibulares não é apenas relevante para entender a posição dentária inicial (HANDELMAN, 1996), mas também para determinar a movimentação ortodôntica e a estabilidade oclusal ao final do tratamento ortodôntico (MASUMOTO et al., 2001).

Conhecer essas estruturas anatômicas é importante para o planejamento

ortodôntico do paciente (TSUNORI et al., 1998), especialmente em situações onde existe uma discrepância esquelética e há possibilidade de execução de tratamento ortodôntico compensatório, com movimentação ortodôntica dos dentes no sentido anteroposterior (HANDELMAN, 1996).

Fuhrmann (2002) explica que pode haver, antes do tratamento ortodôntico, uma desproporção entre o diâmetro vestíbulo-lingual dos incisivos inferiores e do rebordo alveolar, muitas vezes não havendo amplitude óssea suficiente para recobrir toda a raiz dos elementos dentários.

Independente do sistema de braquetes utilizado a mecânica ortodôntica pode descentralizar os dentes do tecido ósseo de suporte, como é observado nos casos de expansão dos arcos dentários (GARIB et al., 2010; FUHRMANN, 2002; NAUERT, BERG, 1999) e nos casos de exodontias de dentes posteriores, onde é realizada a verticalização e retração dos dentes anteriores (KOOK et al., 2015; FUHRMANN, 2002). Devido à maior utilização de mini-implantes e mini-placas (ARAÚJO et al., 2006), os quais permitem grandes movimentações dentárias anteroposteriores, o ortodontista deve considerar a quantidade de osso disponível na região dos incisivos inferiores, em particular quando se planejam retrações desses dentes (MARASSI, MARASSI, 2008). Assim é importante avaliar individualmente a anatomia nessa região, uma vez que ultrapassar esses limites anatômicos poderá causar efeitos colaterais iatrogênicos, resultando em deiscências, fenestrações ósseas e recessões gengivais (KOOK et al., 2015; GARIB et al., 2010; HANDELMAN, 1996).

Ainda, como descrito em outros estudos, o padrão de crescimento facial (braquifacial, mesofacial e dolicofacial) pode exercer influência sobre a anatomia das tábuas ósseas vestibular e lingual (GARIB et al., 2010; BECKMANN et al., 1998; GRACCO et al., 2010; SWASTY et al., 2011; MASUMOTO et al., 2001).

Masumoto *et al.* (2001) fornecem evidências de que diferentes padrões faciais estão associados com diferentes espessuras do osso cortical do corpo da mandíbula. O estudo de Gracco *et al.* (2010), demonstrou, por meio de tomografias computadorizadas, que a espessura da sínfise mandibular era maior em indivíduos com face curta (braquicefálicos) do que pacientes com face longa (dolicocefálicos).

O estudo conduzido por Swasty *et al.* (2011), comparou, através da tomografia computadorizada *Cone Beam*, a espessura óssea da cortical mandibular em pacientes de diferentes padrões faciais e concluiu que a largura e altura apresentavam diferenças significativas de acordo com o tipo facial. Entre os três

grupos faciais avaliados, os pacientes com face longa (dolicofaciais) apresentaram a menores espessuras ósseas.

Por muito tempo, as telerradiografias cefalométricas foram utilizadas para estimar a espessura óssea vestíbulo-lingual que circunda os incisivos (BECKMANN et al., 1998; HANDELMAN, 1996; LUCATO, 2006). Ainda são comumente utilizadas para complementar o exame clínico nas avaliações iniciais de forma, altura e extensão da sínfise mandibular (LUCATO, 2006), e também para o diagnóstico, análise de crescimento e desenvolvimento craniofacial e avaliação dos resultados do tratamento ortodôntico (WEISSHEIMER, 2013).

Entretanto, existe uma limitação para avaliar a espessura vestíbulo-lingual do processo alveolar na região dos incisivos inferiores com a telerradiografia lateral, porque há sobreposição de outros dentes e das estruturas adjacentes (GRACCO et al., 2010; FILHO et al., 2005; GARIB et al., 2010; NAKAJIMA et al., 2005; WEISSHEIMER, 2013). Essa avaliação é ainda mais crítica quando há uma maloclusão presente com apinhamento anteroinferior (FILHO et al., 2008).

O advento da tomografia computadorizada permitiu a reconstrução de áreas anatômicas e sua visualização em três dimensões, revelando informações sobre forma, densidade e tamanho das estruturas que recobrem individualmente cada dente (FILHO et al., 2005; GAIA et al., 2011).

As tomografias computadorizadas *Cone Beam* (TCCB/CBCT), apresentam avanços quando comparadas às tomografias computadorizadas médicas, em termos de custo financeiro, dose de radiação e acurácia, e disponibilizam imagens com grande precisão (SUOMALAINEN et al., 2008; WEISSHEIMER, 2013). As imagens de tomografia computadorizada apresentam grande confiabilidade, tornando possível analisar a espessura e o nível das tábuas ósseas que recobrem os dentes por vestibular e por lingual (FILHO et al., 2005; GARIB et al., 2007, 2010; ROMERO-DELMASTRO et al., 2014).

Estudos que correlacionam a espessura da sínfise mandibular e o nível ósseo alveolar em diferentes níveis do comprimento radicular, através de tomografia computadorizada, com o tipo facial do paciente (TSUNORI et al., 1998; GRACCO et al., 2010; SWASTY et al., 2011) são escassos na literatura.

Desta forma, o objetivo deste estudo foi determinar, através da tomografia computadorizada *Cone Beam*, os limites ósseos no sentido anteroposterior das raízes dos incisivos inferiores e a espessura e altura total da sínfise mandibular e

suas associações com o padrão de crescimento facial, com a inclinação dos incisivos inferiores, com a relação anteroposterior dos maxilares e com a idade dos pacientes.

2 ARTIGO – TOMOGRAPHIC EVALUATION OF THE ANATOMICAL LIMITS OF MANDIBULAR SYMPHYSIS IN ORTHODONTICALLY UNTREATED ADULTS

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TITLE PAGE

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ABSTRACT

INTRODUCTION

The aim of the study was to use Cone Beam Computed Tomography (CBCT) to evaluate bone limits in the lower incisor region and to correlate bone limits with facial growth patterns, lower incisor inclinations, skeletal anteroposterior relationships, and patient age.

METHODS

Tomographic images of 40 orthodontically untreated patients were imported into the OsiriX Lite program, Tomography was used instead of lateral teleradiography to determine facial growth patterns. Sagittal views of the lower incisor region were obtained from multiplanar reconstructions. These images were used to measure the thickness of the entire alveolar bone, thickness and height of mandibular symphysis, and the thickness on the lingual and buccal sides of the alveolar bone. Alveolar bone thickness was measured at 20%, 50%, 80%, and 100% of the length of each lower incisor root. (The apex was at 100%.) Pearson correlation was used to assess correlations between bone thickness and facial patterns, lower incisor inclinations, skeletal anteroposterior relationships, and patient age.

RESULTS

Weak to moderate correlations were seen between bone thickness and facial patterns and between incisor inclination and patient age. There were no associations between facial growth patterns and lingual bone thickness in the lower incisor region or between bone thickness and skeletal anteroposterior relationships.

CONCLUSION

The alveolar process was thinner and longer in the lower incisor region of patients with long faces. The alveolar bone in the lower incisor region of patients with short faces was usually higher and thicker on the labial side and at 50%, 80%, and 100% of the root length.

INTRODUCTION

In orthodontic diagnosis and treatment planning, the morphology of the mandibular symphysis and the positions of the lower incisors are crucial factors.[1,2,3,4,5] Steiner, Ricketts, Tweed and many other authors have determined the ideal inclination of lower incisors and the ideal anteroposterior position.[6] Tweed determine that for a successful outcome, the lower incisors should be upright on their bony base after orthodontic treatment.[1]

The investigation of mandibular bone structures in the lower incisor region determines initial tooth positions[3] and the direction of the orthodontic movement and occlusal stability at the end of orthodontic treatment.[7]

With the increasingly frequent use of skeletal anchorage devices such as mini-implants and miniplates,[8] which allow dental movements of great distance, orthodontists must consider the amount of available bone in the lower incisor region, especially when they are planning tooth retractions or projections.[9] It is also important to know these structures in situations where there is skeletal discrepancy and a possibility of executing compensatory orthodontic treatment, with orthodontic movement in the anteroposterior direction,[3.10] such as in planning cases with pre-molars extraction, in which there is a large movement in the anteroposterior direction.[11,12]

Thus, it is essential to determine the thickness of the alveolar ridge in the mandibular symphysis area; crossing this anatomical limit may cause problems that affect periodontal support and protection, such as dehiscence, bone fenestration, and gum recession.[3,5,11 12]

Some studies[2,5,7,10,13,14] have also demonstrated that facial growth patterns may influence the anatomy of buccal and lingual bone plates. By using CBCT, Swasty et al.[14] compared mandibular cortical bone thickness in patients with different facial patterns and concluded that patients with longer faces had thinner bones. Gracco et al.[2] demonstrated through CBCT scans that the mandibular symphysis was thicker in individuals with short faces than in those with long ones.

CBCT images are highly reliable and hence make it possible to analyze the thickness and level of the bone plates that cover the teeth on the buccal and lingual sides.[15–17] Lateral radiographs, traditionally used for this purpose, are less reliable for evaluating the buccolingual thickness of the alveolar process in the lower incisor

region because other teeth and structures overlap in this area.[2,5,15,18,19]

Therefore, the aims of this study were to use CBCT to determine the thickness of the buccal and lingual bone walls of the lower incisor roots and the thickness and height of the mandibular symphysis in the lower incisor region, and to evaluate the associations between these measurements and facial growth patterns, lower incisor inclinations, skeletal anteroposterior relationships, and patient age.

MATERIALS AND METHODS

Sample

In this retrospective study, CBCT scans of 40 patients treated at a private orthodontic clinic (Proprium Dentistry, Santa Maria, Brazil) were evaluated. The research protocol was approved by the Research Ethics Committee (CEP) of the Federal University of Santa Maria (Santa Maria, Brazil) (Caae: 53310316.0.0000.5346).

The sample consisted of tomographic image exams of male and female adult patients who had not undergone orthodontic or prosthetic treatment, had four lower incisors that had erupted, and had no syndromes or history of periodontal disease. In addition, only tomographic images of good quality (without artifacts or distortions) were included.

Obtaining CBCT scans

The CBCT images were obtained with a Gendex GX CB-500 tomograph (Gendex Dental Systems, Hatfield, PA, USA) with the following settings: 120 kVp, 5 mA, acquisition time of approximately 23 seconds, and a field of view (FOV) that was 14 cm in diameter x 8 cm in height with 0.25 mm voxels.

The scans were obtained with the patient seated with the Frankfurt plane parallel to the ground, and the teeth were in occlusion.

The spatial resolution of the scans was determined by using an acrylic phantom (Gendex Dental Systems, Hatfield, PA, USA), which was cylindrical in shape (50 mm in height x 70 mm in diameter) and had metal markers with 12–18 pairs of lines per centimeter. The phantom’s tomographic image, acquired with the

same specifications as the patients' scans and in accordance with the manufacturer's recommendations, demonstrated that the measurements specified in the equipment manual and the measurements made in the images were uniform. The spatial resolution of tomographic images was determined to be 0.7 mm. Measurements smaller than 0.7 mm showed differences of about 0.1 mm between the measurement in tomographic image and the one specified by the manufacturer.

Intraexaminer reproducibility

The examiner who obtained the measurements from the CBCT images was trained by a dentist who specialized in dental radiology for using the software and manipulating. Intraexaminer agreement was assessed by repeating measurements twice for 20% of the sample with a 1-week interval between each evaluation. By using the Statistical Package for Social Sciences 20 (SPSS Inc., Chicago, IL, USA), the results of this calibration were statistically analyzed to determine the intraclass correlation (ICC) coefficient.

The calibration results were excellent[20] (ICC > 0.9). The demonstration of consistency in the measurements allowed us to move forward with the study. While assessing bone thickness from a patient's CBCT images, the examiner was not aware of that patient's facial growth pattern.

Image processing and measurement

To evaluate facial growth patterns, the tomographic images in Digital Imaging and Communications in Medicine (DICOM) format were imported into the OsiriX Lite program (Pixmeo, Geneva, Switzerland), in which multiplanar reconstruction (MPR) was performed (axial, sagittal, and coronal) to obtain an image corresponding to a cephalometric radiograph profile.

The facial growth pattern was determined by analyzing the facial height index (FHI),[21] which is the ratio of the posterior facial height (PFH) to the anterior facial height (AFH). The PFH was determined as the distance, in millimeters, from the articulation point (intersection point of the bottom surface of the skull's posterior base and the posterior surface of the condyle) to the mandibular plane (represented by a line passing through the Me point and by the lowest point in the gonial region). The

AFH was determined as the distance, in millimeters, from the palatal plane (union of the anterior nasal spine and posterior nasal spine points) to the menti (lowest point on the mandibular symphysis edge intersecting the lower border of mandible).[22] The PFH was measured by contouring the posterior border of the ascending branch of the mandible, and the AFH was held perpendicular to the palatal plane.[22] On the basis of FHI, facial growth patterns were classified as follows: hyperdivergent, FHI values lower than 0.649; normal, FHI values between 0.65 and 0.75;hypodivergent, FHI values greater than 0.751.

Moreover, the same image was used to determine the inclination of the most projected lower central incisor by using Tweed's analysis for the angle of the inclination of the most projected lower incisor (IMPA).[1] This angle is formed by the intersection of the long axis of the lower incisor and the mandibular plane (taking point Me as a previous reference and, as a post reference, the average between the jaw's left and right lower edges in the gonial angle region).[1] The skeletal anteroposterior relationships was also determined by Wits analysis;[23] the distance from the AO point to the BO point (AO-BO), perpendicular to the occlusal plane in maximum intercuspation, was measured.

To perform bone thickness measurements, the tomographic images in the DICOM format were imported into the OsiriX Lite program. We carried out MPRs through the centers of the lower incisor root canals to obtain sagittal views that corresponded to the central portions of the lower incisors.

A root canal image was used as a reference to standardize traces of the long axis of a lower incisor. Root length was defined and measured as the distance from the cementoenamel junction to the apex. A line perpendicular to the incisor's axis was used to establish reference points: 0% of the root represented the cementoenamel junction, and 100%, the apex. The following measurements were made in the sagittal section of the tomographic image: buccal alveolar bone thickness (Figure 1A), lingual alveolar bone thickness (Figure 1A), total alveolar bone thickness (Figure 1B), total mandibular symphysis thickness, and total mandibular symphysis height on the buccal and lingual sides of the lower incisors (Figure 1C).

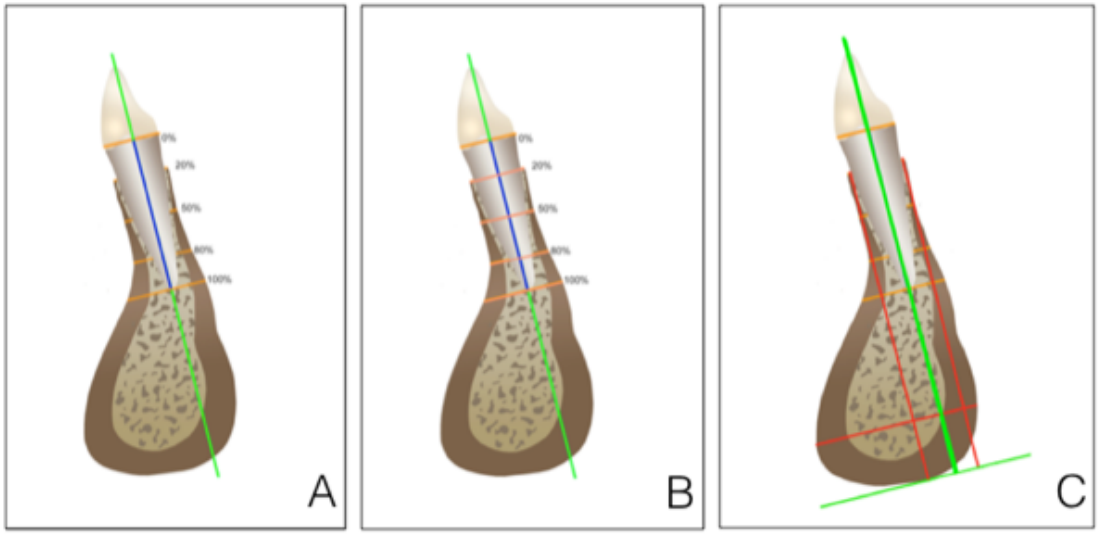
Measurements of alveolar bone thickness on the buccal and lingual sides of the lower incisor roots were performed in four predetermined locations. Lines perpendicular to the long axis of the lower incisor were drawn at 20%, 50%, 80%, and 100% of root length (Figure 1A).

To determine the height of the entire mandibular symphysis, a line parallel to the long axis of the tooth was drawn from the point representing the bony base of the lower incisor to a line perpendicular to the long axis of the tooth and traced at the lowest point of the cortical bone of the mandibular symphysis on the buccal and lingual sides (Figure 1C).

To determine the thickness of the entire mandibular symphysis, a line was drawn perpendicular to the long axis of the tooth in the thickest portion of the mandibular symphysis (Figure 1C). The measurements are presented in Figure 1 written in orange are buccal and lingual bone thickness (Figure 1A) and total thickness (Figure 1B); written in red are the symphysis' buccal and lingual heights in the lower incisor region and the total thickness of the symphysis (Figure 1C).

Fifteen measurements were taken for each incisor (2400 measurements in total).

Figure 1 - Illustration of the measurements of buccal and lingual bone thickness (A) and total bone thickness (B) at different positions along the root length, and of total symphysis thickness and buccal height and lingual height (C).



Source: Authors

Statistical analysis

Statistical analysis was performed by using the Statistical Package for Social Sciences 20 (SPSS Inc, Chicago, IL, USA). Data were analyzed by the Shapiro-Wilk test. Because the data were distributed normally, we used the Pearson correlation

test to evaluate the correlations between bone measurements and FHI, IMPA, skeletal anteroposterior relationships (AO-BO), and patient age.

RESULTS

The mean values and standard deviations for bone thickness at different positions along the root lengths were analyzed, as were the total bone thickness of the mandibular symphysis and heights of the buccal and lingual walls in the lower incisor region. The analysis of the descriptive data (mean and standard deviation) is shown in Table I.

Table I - Mean and standard deviation (SD) of alveolar bone thickness measurements at different positions along the root lengths of lower incisors.

		TEETH 42	TEETH 41	TEETH 31	TEETH 32
MEASURES BUCCAL (mm)	20%	0,52(0,3)	0,48(0,28)	0,42(0,28)	0,53(0,32)
	50%	0,51(0,24)	0,57(0,27)	0,56(0,27)	0,49(0,28)
	80%	1,95(0,97)	1,97(1,34)	2,02(1,26)	1,82(0,94)
	100%	5,07(1,96)	4,72(2,42)	4,7(2,05)	4,69(1,65)
MEASURES LINGUAL (mm)	20%	0,78(0,67)	0,46(0,31)	0,45(0,23)	0,70(0,43)
	50%	1,54(0,85)	0,87(0,42)	0,81(0,4)	1,34(0,76)
	80%	2,27(1,05)	1,19(0,83)	1,7(0,81)	2,11(1,06)
	100%	3,68(1,19)	3,63(1,22)	3,31(1,11)	3,68(1,13)
MEASURES TOTAL (mm)	20%	7,24(0,89)	6,42(0,56)	6,28(0,53)	6,99(0,72)
	50%	7,22(1,00)	6,36(0,68)	6,15(0,61)	6,9(0,95)
	80%	7,62(1,58)	7,07(1,42)	6,89(1,42)	7,4(1,46)
	100%	8,76(2,09)	8,36(2,17)	8,09(2,01)	8,37(1,97)
	THICKNESS	14,85(2,34)	15,19(2,09)	14,99(2,19)	14,64(2,51)
	HEIGHT B	28,74(3,19)	28,70(3,32)	28,85(3,2)	28,94(3,15)
	HEIGHT L	28,55(3,16)	28,62(3,36)	28,73(3,1)	28,9(2,97)

Our sample comprised 40 patients, of which 70% were female. In accordance with Wits analysis, 62.5% of the patients were classified in skeletal Class I; 15%, in Class II; and 22.5%, in Class III.[23]

Tables II–V contain the results of the Pearson correlation test to verify the associations between bone thickness and FHI, IMPA, and cephalometric measurements for the lower central incisors and AO-BO, and patient age.

For tooth 42, a moderate positive correlation (r=0,415) was found between the buccal bone thickness at 50% of the root length (0,51mm ± 0,24) and the patient's FHI. Moderate positive correlations were also observed between total bone thickness and FHI at 80% (r=0,402) (7,62mm ± 1,58) and at 100% of the root length (r=0,403) (8,76mm ± 2,09). However, the correlation between lingual bone height (28,55mm ± 3,16) and FHI was moderately negative (r=-0,405).

For tooth 41, a moderate positive correlation (r=0,404) was found between the FHI and buccal bone thickness at the apex level (4,72mm ± 2,42). We also found a moderate positive correlation (r=0,460) between the FHI and the total bone thickness at the apex level (8,36mm ± 2,17). In addition, moderate negative correlations between FHI and buccal bone height (r=-0,448) (28,70mm ± 3,32) and between FHI and lingual bone height (r=-0,425) (28,62mm ± 3,36) were observed.

For tooth 31, a moderate positive correlation between FHI and the buccal bone thickness at 100% of the root length (r=0,405) (4,7mm ± 2,05) was found. Moreover, there was a moderate positive correlation (r=0,428) between FHI and total bone thickness at the apex level (8,09mm ± 2,01). We could also see a moderate negative correlation between FHI and buccal bone height (r=-0,451) (28,85mm ± 3,2) and between FHI and lingual bone height (r=-0,416) (28,73mm ± 3,1).

For tooth 41, there was a moderate positive correlation (r=0,450) between the total thickness of the mandibular symphysis (15,19mm ± 2,09) and the IMPA, and for tooth 31, there was a moderate positive correlation (r=0,329) between total bone thickness at 20% of root length (6,28mm ± 0,53) and the IMPA.

Bone thickness measurements made on the lingual surfaces of the teeth showed no correlation with FHI ($P > 0.05$).

Variations in the sagittal skeletal relationship determined by the AO-BO cephalometric measurement were not correlated with bone thickness in the lower incisor region ($P > 0.05$).

Weak to moderate negative correlations were found between age and some

measurements of the buccal, lingual, and entire bone plate (Tables II–V). In contrast, weak positive correlations were seen between age and most of the buccal and lingual height measurements of the symphysis (Tables II–V).

Table II - Pearson correlation for bone thickness measurements of tooth 42.

			FHI	AO.BO	AGE
MEASURES BUCCAL (mm)	20%	r	,083	,003	-,355*
		p	,610	,985	,025
	50%	r	,415*	,261	,108
		p	,008	,104	,506
	80%	r	,382*	,164	-,198
		p	,015	,313	,221
	100%	r	,382*	,165	-,234
		p	,015	,308	,146
MEASURES LINGUAL (mm)	20%	r	,190	-,009	-,321*
		p	,241	,957	,044
	50%	r	,219	-,113	-,273
		p	,175	,488	,088
	80%	r	,216	-,236	-,233
		p	,181	,142	,148
	100%	r	,078	-,302	-,094
		p	,633	,058	,565
MEASURES TOTAL (mm)	20%	r	,123	-,079	-,457*
		p	,448	,630	,003
	50%	r	,238	-,005	-,338*
		p	,140	,976	,033
	80%	r	,402*	-,022	-,337*
		p	,010	,893	,033
	100%	r	,403*	-,017	-,273
		p	,010	,915	,088
	THICKNESS	r	,175	,089	-,119
		p	,281	,584	,464
	HEIGHT B	r	-,397*	,104	,318*
		p	,011	,524	,046
	HEIGHT L	r	-,405*	,109	,327*
		p	,009	,503	,040

*Indicates a statistically significant difference (p≤0.05).

Table III - Pearson correlation for bone thickness measurements of tooth 41.

			FHI	IMPA	AO.BO	AGE
MEASURES BUCCAL (mm)	20%	r	,168	,058	,236	-,292
		p	,299	,723	,143	,068
	50%	r	,332*	,173	,106	,000
		p	,036	,285	,517	,999
	80%	r	,366*	,243	,130	-,217
		p	,020	,131	,424	,180
	100%	r	,404*	,258	,135	-,207
		p	,010	,108	,406	,199
MEASURES LINGUAL (mm)	20%	r	,131	-,249	,132	-,380*
		p	,420	,121	,416	,016
	50%	r	,090	-,082	,140	-,033
		p	,581	,615	,387	,838
	80%	r	,001	-,056	-,189	,070
		p	,996	,731	,244	,668
	100%	r	,016	-,027	-,168	,053
		p	,921	,869	,301	,744
MEASURES TOTAL (mm)	20%	r	,199	,145	,223	-,434*
		p	,218	,373	,167	,005
	50%	r	,270	,266	,158	-,126
		p	,092	,097	,331	,440
	80%	r	,375*	,182	,041	-,188
		p	,017	,260	,801	,244
	100%	r	,460*	,284	,056	-,201
		p	,003	,076	,732	,213
	THICKNESS	r	,282	,450*	,117	-,269
		p	,078	,004	,474	,093
	HEIGHT B	r	-,448*	,034	,162	,268
		p	,004	,834	,317	,095
	HEIGHT L	r	-,425*	-,024	,140	,344*
		p	,006	,885	,390	,030

*Indicates a statistically significant difference (p≤0.05).

Table IV - Pearson correlation for bone thickness measurements of tooth 31.

			FHI	IMPA	AO.BO	AGE
MEASURES BUCCAL (mm)	20%	r	,280	,163	,170	-,329*
		p	,080	,315	,293	,038
	50%	r	,219	-,106	,290	,014
		p	,174	,517	,069	,932
	80%	r	,373*	,157	,203	-,155
		p	,018	,334	,210	,339
	100%	r	,405*	,300	,220	-,162
		p	,010	,060	,173	,318
MEASURES LINGUAL (mm)	20%	r	,232	-,033	,200	-,375*
		p	,150	,842	,217	,017
	50%	r	-,036	,072	,010	-,277
		p	,827	,660	,951	,083
	80%	r	-,006	-,003	-,229	-,133
		p	,971	,983	,154	,412
	100%	r	,024	,023	-,268	-,134
		p	,881	,888	,095	,411
MEASURES TOTAL (mm)	20%	r	,157	,329*	,116	-,385*
		p	,333	,038	,476	,014
	50%	r	,137	,226	,176	-,187
		p	,399	,160	,277	,248
	80%	r	,353*	,274	,065	-,256
		p	,025	,087	,689	,111
	100%	r	,428*	,308	,076	-,240
		p	,006	,053	,639	,136
	THICKNESS	r	,199	,312	,204	-,201
		p	,218	,050	,206	,213
	HEIGHT B	r	-,451*	-,130	,163	,294
		p	,003	,423	,314	,065
	HEIGHT L	r	-,416*	-,158	,123	,336*
		p	,008	,331	,448	,034

*Indicates a statistically significant difference (p≤0.05).

Table V - Pearson correlation for bone thickness measurements of tooth 32.

			FHI	AO.BO	AGE
MEASURES BUCCAL (mm)	20%	r	,174	,115	-,191
		p	,282	,478	,237
	50%	r	,303	,057	,175
		p	,058	,725	,281
	80%	r	,368*	,159	-,157
		p	,020	,327	,333
	100%	r	,388*	,141	-,204
		p	,013	,385	,207
MEASURES LINGUAL (mm)	20%	r	,221	-,052	-,426*
		p	,170	,750	,006
	50%	r	-,002	,079	-,304
		p	,992	,627	,056
	80%	r	,157	-,129	-,225
		p	,333	,428	,163
	100%	r	,087	-,248	-,207
		p	,593	,122	,200
MEASURES TOTAL (mm)	20%	r	,160	,078	-,370*
		p	,325	,634	,019
	50%	r	,151	,126	-,327*
		p	,353	,437	,040
	80%	r	,334*	,002	-,300
		p	,035	,989	,060
	100%	r	,376*	-,024	-,290
		p	,017	,883	,070
	THICKNESS	r	,047	,138	-,213
		p	,772	,396	,187
	HEIGHT B	r	-,342*	,088	,323*
		p	,031	,591	,042
	HEIGHT L	r	-,349*	,114	,342*
		p	,027	,484	,031

*Indicates a statistically significant difference (p≤0.05).

DISCUSSION

In the present study, in addition to measurements of the total thickness and height of the mandibular symphysis, measurements of the buccal, lingual, and entire alveolar bone were obtained at 20%, 50%, 80%, and 100% of root length of each of the 4 lower incisors, and associations between these measurements and the patient's facial growth pattern were evaluated. Tweed[1] has reported that for treatment stability, orthodontic procedures must be performed within the limits of tooth movement, which must be determined for correct diagnosis and planning. The diagnostic evaluation of alveolar bone structure in the incisor regions is important to balance the gains and iatrogenic effects of orthodontic treatment.[24]

In this study, a patient's facial growth pattern was determined by calculating that patient's FHI, [21] which was then used to classify his or her face as long, normal, or short.[10] When the PFH increases more than the AFH, a counterclockwise jaw rotation occurs and thus reduces the divergence between the horizontal planes. On the other hand, if the AFH increases more than the PFH, the jaw rotates clockwise and thus elongates the patient's face.[21] According to Horn,[21] the FHI can be compared to the FMA in Tweed's analysis, just as AO-BO can be compared with the ANB angle. However, it should be noted that Wits' analysis may vary according to the patient's occlusal plane. [23]

This study verified that, in most cases, the bone thickness of the lower incisors increased from the cervical portion to the apical portion of the root, as was found by Nauert and Berg.[4] However, we noticed that in some cases, there was a decrease in the bone thickness from the portion closest to the cervix (20% of the root length) to 50% of the root length, but after that there was a gradual increase until the apex level. Furthermore, in most cases, the average values for bone thicknesses and heights were similar among the 4 lower incisors (Table I).

We found that as the FHI increased, bone thickness increased in most regions, but bone height decreased in the buccal and lingual regions. Thus, one assumes that a dolichofacial or hyperdivergent patient presents a thinner and longer alveolar process in the lower incisor region, but that a patient with a brachyfacial growth pattern has a thicker and shorter alveolar process. This result confirms what was already revealed by Handelman[3] and Swasty et al.,[14] who showed that patients with longer faces featured thinner bone structure at all of the measured mandibular

sites, although this finding was not significant in every study. However, the finding was confirmed by other studies that show that the dolichofacial pattern is associated with greater bone height (longer symphysis).[5,10,14]

In our study, as the FHI increased, in most cases, the buccal bone thickness at 50%, 80%, and 100% of root length also increased. Thus, it is believed that patients with brachyfacial growth patterns usually have greater buccal bone thickness in these regions. Gracco et al.[2] also observed greater buccal bone thickness at the root's apex level in brachyfacial patients. Tsunori et al.[10] found an association between the FHI and buccal cortical bone in the mandibular symphysis. Handelman[3] also found greater buccal bone thickness in the lower incisors of patients with short faces.

At 20% of the root lengths of all of the lower incisors, there were no correlations between the FHI and buccal, lingual, or total bone thickness. Furthermore, it was not possible to find associations between facial growth patterns and bone thickness at 20% of the root length. Therefore, special attention is required when planning movements, projections, or retroinclinations of the lower incisors of dolichofacial patients. Owing to the thin bone in this region (Table I), iatrogenic sequelae may occur after orthodontic movements.[3,4]

In addition, the buccal bone was thin at 20% of the root length (Table I), which matches the results found by Nauert and Berg,[4] they found that in 35% of the evaluated cases, measurable bone thickness could not be visualized at 20% of the root length. Furthermore, in 25% of cases, the bone structure could not be visualized in the region between half of the root length and the apical third of the root.[4]

In the present study, we also found that as the FHI increased, total bone thickness also increased at 80% and 100% of root length. Gracco et al.[2] also found that in most lower incisors, the total bone thickness at 100% of the root length (apex level) was greater in brachyfacial patients than in dolichofacial patients. Therefore, buccolingual movement in the root apex may be more likely to occur in brachyfacial patients who undergo lower incisor projection, retroinclination, or body movement.

This study also verified that buccal bone thickness is greater than lingual bone thickness in the apex region (Table I), a finding that indicates that the root apex of a lower incisor is closer to the lingual side. This fact must be analyzed when planning buccal or lingual inclination movements in the lower incisors. This result is consistent with the finding by Farret et al.,[25] who assessed the positions of the upper and lower

incisors in patients who underwent orthodontic treatment and concluded that the apices of the lower incisors are closer to the lingual cortical plate than to the buccal cortical plate of the mandibular symphysis.

However, no association was found between facial growth patterns and lingual alveolar bone thickness. This result is in agreement with the finding by Tsunori et al.,[10] who did not find a significant association between FHI and the thickness of the lingual cortical bone of the mandibular symphysis. Swasty et al.[14] also found no statistically significant differences between facial growth patterns and the thickness of lingual cortical bones in the mandibular symphysis region.

This information is important if a premolar must be extracted to reduce dental protrusion, because there was no statistically significant association between lingual bone measurements and FHI. Hence, all individuals, not only dolichofacial ones, should receive special attention during the planning of orthodontic treatments in which the extraction of posterior teeth and the retraction of anteroinferior teeth will be performed.

The total bone thickness of the mandibular symphysis, measured at the thickest portion of the mandibular symphysis and perpendicular to the tooth's long axis, was not significantly associated with facial growth patterns, skeletal anteroposterior relationships, or patient age. These results corroborate those found by Tsunori et al.,[10] who also found no associations between facial growth patterns and the total width of the mandibular symphysis.

Moreover, as the FHI increased, buccal and lingual bone heights decreased. Therefore, it seems that patients with hyperdivergent facial growth had greater buccal bone height and lingual bone height. These results confirm the findings by Swasty et al.[14] and Handelman,[3] who concluded that dolichofacial patients have greater bone height in the mandibular symphysis region.

In this study, we did not prove an association between the skeletal anteroposterior relationships and bone measurements in the lower incisor region. The different skeletal relationships (Classes I, II, and III) between the bone bases are not significantly associated with bone thickness differences in the lower incisor region. Some studies[3,26–28] show that Class III skeletal patients have thinner bones, but this finding may be due to the type of cephalometric analysis used in each study. Compared to patients with Class II malocclusions, those with Class III malocclusions had thinner lingual bones in the apex regions of the lower incisors.[3] However,

according to Chung et al.,[27] other factors associated with the skeletal Class III relationship, such as the vertical relationship between the anterior teeth, may influence bone thickness in the lower incisors.

There was also an association between the age of the patient and bone thickness. With increasing age, increase in symphysis height and reduction in alveolar bone thickness were observed, especially at 20% and 50% of the root lengths. It is believed that the increased symphysis height is due to constant alveolar growth. The relationship between bone thickness and patient age indicates that buccolingual movement of the lower incisors in adult patients should be performed cautiously. Garcia et al.,[26] after analyzing a sample of lateral cephalometric radiographs, found no relationship between the thickness of the alveolar process in the anterior mandible and patient age.

A positive association was observed between the IMPA and the total thickness of the mandibular symphysis when tooth 41 was the most projected. When tooth 31 was the most projected, a positive association was observed between the IMPA and the total alveolar bone thickness at 20% of root length. Perhaps the thicker symphysis allowed greater movement of the lower incisors in patients who had not undergone orthodontic treatment.

Our findings demonstrate that a careful analysis of each individual's bone condition must be performed in order to determine need for premolar extractions, biomechanics, and extent of movements to be performed. It is believed that patients with a more vertical growth pattern (with lower FHI) require more stringent standards for buccolingual movement of the lower incisors than do patients with other facial patterns.

These findings indicated that in cases of orthodontic decompensation, especially in the anterior region, anatomical limits must be observed during the preparation for orthognathic surgery. In treatment plans that include retractions of the lower teeth, it is suggested that skeletal anchorage devices be used in the posterior region of the mandible to distalize molars, associated with interproximal wear in the lower incisors, in order to prevent movements of great amplitude in this region. In planning premolar tooth extractions, the movement of the incisors should be mostly vertical in order to relieve anteroinferior crowding. In addition, because the bones in this region are small, controlled vertical movements or ones of slight projection should be preferred when compared to body movements of the lower incisors.

It is important to note that image quality limits the ability to perform linear measurements on CBCT images, especially when the structures are small, as they were in this study. The picture quality of a CBCT, represented by its spatial resolution, depends on factors such as scanner settings, patient position, and voxel size.[19,29] Ballrick et al.[30] claim that poor spatial resolution can make it impossible to detect differences between 2 small objects. The authors also state that tomographic scans with smaller voxel sizes are required, but smaller voxel sizes require higher doses of radiation for the patient. According to Sun et al.,[31] reducing the voxel size from 0.4 mm to 0.25 mm would be suitable for analyzing small structures with better precision and would improve the accuracy of linear measurements on CBCT scans.

The CBCT scan of the acrylic phantom demonstrated the spatial resolution limitation in this study; measurements smaller than 0.7 mm should have been observed with caution.

Because of FOV limitations, we could not perform more conventional measurements of the anterior cranial base for the cephalometric analysis of facial growth patterns, such as FMA, S-N.Go-Gn, and Ricketts' VERT Index.

In addition, in studies with larger sample sizes, segmentation by age and facial growth pattern should be carried out to complement the findings of this study.

Finally, we suggest the use of CBCT to complement the findings from X-rays and initial clinical assessments because it provides valuable information about labiolingual alveolar bone support in the lower incisor region, which is a critical area for lower incisor movement.

CONCLUSIONS

In this study, relationships were found between bone thickness and some, but not all, of the parameters we examined. Based on this study's findings, we believe that:

Patients with a tendency to dolichofacial growth pattern present alveolar process in the lower incisors region with thinner bone thickness and longer in the vertical direction; Patients with a tendency to brachyfacial growth pattern had, with few exceptions, higher buccal bone thickness by 50%, 80% and 100% of the root length and higher total bone thickness to the level of 80% and 100% of the root length; No

associations were found between facial growth patterns and lingual bone thickness in the lower incisor regions, nor between the total thickness of the mandibular symphysis and facial growth patterns. The inclinations of the lower central incisors were not associated with most of the bone thickness measurements. No association was found between the skeletal anteroposterior relationship and bone height or bone thickness. An increase in age corresponded with a decrease in bone thickness, especially at 20% of the root length, as well as with an increase in height in the mandibular symphysis region.

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3 CONSIDERAÇÕES FINAIS

Apesar dos objetivos propostos nesse estudo serem cumpridos, correlações fracas à moderadas foram encontradas entre as espessuras ósseas alveolares na região dos incisivos inferiores e o padrão de crescimento facial do paciente.

Assim, a execução de novas pesquisas com maior tamanho de amostra e menor tamanho de voxel das tomografias computadorizadas seria uma alternativa para determinar mais força nas correlações.

Com base nos resultados deste estudo, acredita-se que pacientes com tendência à padrão de crescimento facial braquifacial apresentam maiores espessura ósseas alveolares totais e vestibulares na região dos incisivos inferiores. Assim como, acredita-se que pacientes com tendência à padrão de crescimento dolicofacial apresentam processo alveolar na região dos incisivos inferiores com menor espessura óssea e mais longo no sentido vertical.

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APÊNDICE A – AUTORIZAÇÃO INSTITUCIONAL – UFSM

Autorização Institucional

Eu, Walter Blaya Perez, abaixo assinado, responsável pelo Departamento de Estomatologia da Universidade Federal de Santa Maria (UFSM, Santa Maria, RS), autorizo a realização do estudo "Avaliação tomográfica da espessura óssea da sínfise mandibular em diferentes padrões faciais: um estudo retrospectivo", a ser conduzido pelo pesquisador Prof. Dr. Vilmar Antônio Ferrazzo e pela mestranda Paula Guerino.

Fui informado, pelo responsável do estudo, sobre as características e objetivos da pesquisa, bem como das atividades que serão realizadas na instituição a qual represento.

Esta instituição está ciente de suas responsabilidades como instituição co-participante do presente projeto de pesquisa e de seu compromisso no resguardo da segurança e bem-estar dos sujeitos de pesquisa nela recrutados, dispondo de infra-estrutura necessária para a garantia de tal segurança e bem-estar.

28 / 01 / 16
Data

Walter Blaya Perez
-Chefe Dept.º Estomatologia

Assinatura e carimbo do responsável institucional

APÊNDICE B – AUTORIZAÇÃO INSTITUCIONAL – PROPRIUM ODONTOLOGIA

Autorização Institucional

Eu, Vilmar Antônio Ferrazzo, abaixo assinado, responsável pela clínica privada Proprium Odontologia (Santa Maria, RS), autorizo a realização do estudo "Avaliação tomográfica da espessura óssea da sínfise mandibular em diferentes padrões faciais: um estudo retrospectivo", a ser conduzido por mim e pela mestranda Paula Guerino.

Fui informado, pelo responsável do estudo, sobre as características e objetivos da pesquisa, bem como das atividades que serão realizadas na instituição a qual represento.

Esta instituição está ciente de suas responsabilidades como instituição co-participante do presente projeto de pesquisa e de seu compromisso no resguardo da segurança e bem-estar dos sujeitos de pesquisa nela recrutados, dispondo de infra-estrutura necessária para a garantia de tal segurança e bem-estar.

28/01/16
Data

Assinatura e carimbo do responsável institucional

Vilmar A. Ferrazzo
ODONTOLOGIA
CRO/RS 6500

APÊNDICE C – SOLICITAÇÃO DE ISENÇÃO DO TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

Solicitação de Isenção do Termo de Consentimento Livre e Esclarecido

Título do projeto: Avaliação tomográfica da espessura óssea da sínfise mandibular em diferentes padrões faciais: um estudo retrospectivo
Pesquisador responsável: Prof. Dr. Vilmar Antônio Ferrazzo
Instituição/Departamento: Universidade Federal de Santa Maria (UFSM) - Departamento de Estomatologia
Telefone: (55) 3220-9210

Ao Comitê de Ética em Pesquisa da Universidade Federal de Santa Maria (UFSM):

Vimos por meio deste documento solicitor a dispensa de obtenção de um Termo de Consentimento Livre e Esclarecido (TCLE) para o estudo intitulado "Avaliação tomográfica da espessura óssea da sínfise mandibular em diferentes padrões faciais: um estudo retrospectivo" proposto por Vilmar Antônio Ferrazzo.

A dispensa do uso de TCLE se fundamenta: **I)** por ser um estudo observacional, analítico ou descritivo retrospectivo, que empregará apenas informações de prontuários médicos, sistemas de informação institucionais e/ou demais fontes de dados e informações clínicas disponíveis na instituição sem previsão de utilização de material biológico; **II)** porque todos os dados serão manejados e analisados de forma anônima, sem identificação nominal dos participantes de pesquisa; **III)** porque os resultados decorrentes do estudo serão apresentados de forma agregada, não permitindo a identificação individual dos participantes, e **IV)** porque se trata de um estudo não intervencionista (sem intervenções clínicas) e sem alterações/influências na rotina/tratamento do participante de pesquisa, e consequentemente sem adição de riscos ou prejuízos ao bem-estar dos mesmos.

O investigador principal e demais colaboradores envolvidos no estudo acima se comprometem, individual e coletivamente, a utilizar os dados provenientes deste, apenas para os fins descritos e a cumprir todas as diretrizes e normas regulamentadoras descritas na Res. CNS Nº 466/12, e suas complementares, no que diz respeito ao sigilo e confidencialidade dos dados coletados.

Santa Maria, 28/01/16.

Assinatura do pesquisador responsável — 2032694057 Número de documento de identidade

APÊNDICE D – TERMO DE CONFIDENCIALIDADE

Termo de confidencialidade

Título do projeto: Avaliação tomográfica da espessura óssea da sínfise mandibular em diferentes padrões faciais: um estudo retrospectivo

Pesquisador responsável: Prof. Dr. Vilmar Antônio Ferrazzo

Instituição/Departamento: Universidade Federal de Santa Maria (UFSM) - Departamento de Estomatologia

Telefone: (55) 3220-9210

Os pesquisadores do presente projeto se comprometem a preservar a confidencialidade dos dados dos participantes desta pesquisa, cujos dados serão coletados por meio de avaliação de exames de imagem, realizados previamente pelos pacientes, proveniente de clínica privada (Proprium Odontologia – Santa Maria, RS). Informam, ainda, que estas informações serão utilizadas, única e exclusivamente, para execução do presente projeto.

As informações somente poderão ser divulgadas de forma anônima e serão mantidas na UFSM – Rua Marechal Floriano Peixoto, 1184, centro, prédio da Antiga Reitoria, sala: Clínica de Ortodontia, 2º andar – 97015-372 - Santa Maria - RS, por um período de cincos anos, sob a responsabilidade do professor Vilmar Antônio Ferrazzo. Após este período os dados serão destruídos.

Este projeto de pesquisa foi aprovado pelo Comitê de Ética em Pesquisa da UFSM em 15 de março de 2016, e recebeu o número Caae 53310316.0.0000.5346 .

Santa Maria,

_____

Assinatura do pesquisador responsável.

Comitê de Ética em Pesquisa da UFSM: Av. Roraima, 1000 - 97105-900 - Santa Maria - RS - 2º andar do prédio da Reitoria. Telefone: (55) 3220-9362 - E-mail: cep.ufsm@gmail.com.

ANEXO A – PARECER CONSUBSTANCIADO DO CEP

UNIVERSIDADE FEDERAL DE SANTA MARIA/ PRÓ-REITORIA DE PÓS-GRADUAÇÃO E

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Avaliação tomográfica da espessura óssea da sínfise mandibular em diferentes padrões faciais: um estudo retrospectivo

Pesquisador: VILMAR ANTONIO FERRAZZO

Área Temática:

Versão: 1

CAAE: 53310316.0.0000.5346

Instituição Proponente: Departamento de Estomatologia

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 1.452.312

Apresentação do Projeto:

O objetivo do presente estudo será avaliar os limites anatômicos da sínfise mandibular, na região dos incisivos inferiores, através da tomografia computadorizada, nos diferentes padrões de crescimento facial: mesofacial, dolicofacial e braquifacial.

A pesquisa será um estudo observacional retrospectivo, na qual serão avaliadas 33 tomografias Cone Beam de cada padrão facial. O índice VERT de Ricketts será utilizado para a determinação do padrão de crescimento facial.

As imagens tomográficas, obtidas de pacientes de uma clínica odontológica privada (Santa Maria, RS), serão importadas para o programa Osirix Lite (Pixmeo, Geneva, Switzerland), onde serão feitas reconstruções multiplanares para obtenção de cortes sagitais da sínfise mandibular. Nestas imagens, serão mensuradas as espessuras ósseas alveolares nas faces vestibular, lingual e total dos incisivos inferiores, além das mensurações de espessura e altura total da sínfise mandibular. As medidas das espessuras ósseas alveolares vestibular, lingual e total da sínfise serão obtidas em quatro locais pré-determinados, correspondendo a 20, 50, 80 e 100% do comprimento radicular dos incisivos inferiores, delimitado pela junção cemento-esmalte ao ápice radicular. As variações

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da espessura e altura da sínfise serão correlacionadas com o padrão facial, demonstrando as possíveis limitações anatômicas no movimento anteroposterior dos incisivos inferiores durante o tratamento ortodôntico.

Objetivo da Pesquisa:

- Analisar os limites anatômicos da sínfise mandibular na região dos incisivos inferiores, em pacientes adultos não tratados ortodonticamente, através da tomografia computadorizada, e correlacionar com os diferentes padrões de crescimento facial: mesofacial, dolicofacial e braquifacial.
- Determinar, através de tomografia computadorizada, a espessura do osso alveolar nas faces vestibular e lingual, assim como a espessura total do osso alveolar dos incisivos inferiores, em quatro níveis específicos do comprimento radicular e correlacionar com os diferentes padrões de crescimento facial;
- Analisar a morfologia da sínfise mandibular determinando a espessura e a altura total e correlacionar com os diferentes padrões de crescimento facial.

Avaliação dos Riscos e Benefícios:

Quanto aos benefícios advindos da pesquisa, o sujeito de pesquisa não será beneficiado diretamente sobre o objetivo da pesquisa.

Quanto ao risco de exposição dos dados do paciente estes estarão protegido pelo Termo de Confidencialidade, determinando a privacidade sob suas informações. Os dados serão manipulados e analisados de forma anônima, sem identificação nominal dos participantes e os resultados serão apresentados de forma agregada, não permitindo a identificação individual dos participantes.

Comentários e Considerações sobre a Pesquisa:

.

Considerações sobre os Termos de apresentação obrigatória:

São apresentados de forma adequada.

Propõe dispensa de TCLE: I) por ser um estudo observacional, analítico ou descritivo retrospectivo, que empregará apenas informações de prontuários médicos, sistemas de informação institucionais e/ou demais fontes de dados e informações clínicas disponíveis na instituição sem previsão de utilização de material biológico; II) porque todos os dados serão manejados e analisados de forma anônima, sem identificação nominal dos participantes de pesquisa; III) porque os resultados decorrentes do estudo serão apresentados de forma agregada, não permitindo a identificação individual dos participantes, e IV) porque se trata de um estudo não intervencionista (sem intervenções clínicas) e sem alterações/influências na rotina/tratamento do participante de pesquisa, e consequentemente sem adição de riscos ou prejuízos ao bem-estar dos mesmos.

O investigador principal e demais colaboradores envolvidos no estudo acima se comprometem, individual e coletivamente, a utilizar os dados provenientes deste, apenas para os fins descritos e a cumprir todas as diretrizes e normas regulamentadoras descritas na Res. CNS 466/12, e suas complementares, no que diz respeito ao sigilo e confidencialidade dos dados coletados.

Recomendações:

Veja no site do CEP - http://w3.ufsm.br/nucleodecomites/index.php/cep - na aba "orientações gerais", modelos e orientações para apresentação dos documentos. ACOMPANHE AS ORIENTAÇÕES DISPONÍVEIS, EVITE PENDÊNCIAS E AGILIZE A TRAMITAÇÃO DO SEU PROJETO.

Conclusões ou Pendências e Lista de Inadequações:

.

Considerações Finais a critério do CEP:

Este parecer foi elaborado baseado nos documentos abaixo relacionados:

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_661610.pdf	17/02/2016 23:20:18		Aceito
Folha de Rosto	FOLHADEROSTO.pdf	17/02/2016 23:18:17	VILMAR ANTONIO FERRAZZO	Aceito

UNIVERSIDADE FEDERAL DE SANTA MARIA/ PRÓ-REITORIA DE PÓS-GRADUAÇÃO E

Continuação do Parecer: 1.452.312

Cronograma	cronograma1.pdf	11/02/2016 09:05:09	VILMAR ANTONIO FERRAZZO	Aceito
Outros	GAPV.pdf	10/02/2016 15:56:42	VILMAR ANTONIO FERRAZZO	Aceito
Projeto Detalhado / Brochura Investigador	ProjetoCEP.pdf	10/02/2016 15:25:05	VILMAR ANTONIO FERRAZZO	Aceito
Declaração de Pesquisadores	Termodeconfidencialidade.pdf	10/02/2016 15:23:35	VILMAR ANTONIO FERRAZZO	Aceito
Declaração de Instituição e Infraestrutura	Autorizacaoinstitucionalproprium.pdf	10/02/2016 15:21:27	VILMAR ANTONIO FERRAZZO	Aceito
Declaração de Instituição e Infraestrutura	AutorizacaoinstitucionalUFSM.pdf	10/02/2016 15:21:15	VILMAR ANTONIO FERRAZZO	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	SolicitacaoTCLE.pdf	10/02/2016 15:20:02	VILMAR ANTONIO FERRAZZO	Aceito

Situação do Parecer:
Aprovado

Necessita Apreciação da CONEP:
Não

SANTA MARIA, 15 de Março de 2016

Assinado por:
CLAUDEMIR DE QUADROS
(Coordenador)

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ANEXO B – NORMAS DO PERIÓDICO – American Journal of Orthodontics & Dentofacial Orthopedics

ELSEVIER

AMERICAN JOURNAL OF ORTHODONTICS AND DENTOFACIAL ORTHOPEDICS

Official Journal of the American Association of Orthodontists, its constituent societies, the American Board of Orthodontics, and the College of Diplomates of the American Board of Orthodontics

AUTHOR INFORMATION PACK

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DESCRIPTION

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