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ÁREA DE CONCENTRAÇÃO EM CLÍNICA ODONTOLÓGICA/ RADIOLOGIA

AVALIAÇÃO DA SIMETRIA BILATERAL DO NÚMERO DE CANAIS DA RAIZ
MESIOVESTIBULAR E DA FREQUÊNCIA DE LESÃO PERIAPICAL EM MOLARES
SUPERIORES OBTURADOS: UM ESTUDO RETROSPECTIVO

TANARA PRUX FEHLBERG

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Tese apresentada ao Programa de Pós-Graduação em Odontologia, linha de pesquisa Diagnóstico das Afecções Buco-Faciais da Universidade Federal do Rio Grande do Sul, como parte dos pré-requisitos necessários para a obtenção de título de Doutor em Clínica Odontológica/Radiologia.

Orientador: Prof. Dr. Heraldo Luís Dias da Silveira

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"Existe somente uma idade para ser feliz.
Essa idade não depende dos anos vividos.
O importante é tentar algo novo, de novo e de novo,
E quantas vezes for preciso.
Essa idade tão fugaz na vida da gente chame-se PRESENTE.

Mário Quintana

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RESUMO

Introdução: A presença de dois canais na raiz mesiovestibular (MV) dos primeiros molares superiores (1MSs) é um achado bastante comum, sendo a negligência na desinfecção e obturação deste canal uma das causas de insucesso no tratamento endodôntico de 1MSs. Especialmente em casos de retratamento endodôntico, a tomografia computadorizada de feixe cônico (TCFC) apresenta-se como um instrumento auxiliar de grande valor na pesquisa do canal mesiopalatino (MP), embora apresente limitações quando da presença de materiais hiperdensos próximos à estrutura que se deseja avaliar. Objetivos: Comparar a similaridade do número de canais da raiz MV dos 1MSs em dois grupos, um com ambos 1MSs não obturados (G1) e outro com um 1MS obturado e seu homólogo não obturado (G2), por meio de TCFC. E, avaliar a presença de lesões periapicais em 1MSs com condutos obturados endodonticamente e a relação destas com a visualização do canal MP na raiz MV, a partir de seus homólogos não obturados. Metodologia: Para o estudo, utilizou-se um banco de dados de uma clínica de radiologia, a partir do qual foram selecionados exames tomográficos de 553 pacientes que apresentavam os dois 1MSs, 289 com um deles endodonticamente obturado. Os exames foram avaliados para a presença do canal MP, sendo divididos em simétricos (presença/ausência do canal nos 1MSs direito e esquerdo) e assimétricos, e para o diagnóstico de lesão periapical nos dentes com material obturador de canal. Resultados: No G1, a simetria foi de 78,79% sendo que em 178 (67,42%) casos verificou-se a presença do canal MP bilateralmente. No G2, a simetria foi observada em 198 (68,5%) dos exames analisados e em 153 (52,9%) o canal MP foi visualizado em ambos os molares. Encontrou-se diferença estatisticamente significante entre os dois grupos, com maior probabilidade de casos assimétricos no G2. Quanto a presença de lesões periapicais, foram observadas imagens sugestivas de lesão periapical em 63,7%, sendo que a presença de material obturador nos condutos radiculares pode ter dificultado a visualização do canal MP, assim, a avaliação do homólogo, quando possível, pôde auxiliar no diagnóstico.

Palavras-chave: Molares. Canal Radicular. Tomografia Computadorizada de Feixe Cônico. TCFC.

ABSTRACT

Introduction: The presence of two canals in the mesiobuccal root (MB) of maxillary first molars (1MMs) is a very common finding, the negligence in the disinfection and filling of this canal is one of the causes of endodontic treatment failure. Especially in cases of endodontic retreatment, Cone-Beam Computed Tomography (CBCT) is a valuable auxiliary tool in the investigation of the second mesiobuccal canal (MB2), although it presents limitations when the evaluated structure is close to hyperdense materials. Objectives: To compare the similarity of the number of MB root canals of 1MM in two groups, one with both 1MM untreated (G1) and the other with one obturated 1MM and its homologous untreated (G2) by CBCT. And evaluate the presence of periapical lesions in obturated 1MMs and their relationship with MB2 canal visualization in their untreated homologous. Methods: A radiology clinic database was used for the study, 553 patients scans with the two 1MMs were selected, 289 with one of them obturated. The exams were evaluated for the presence of MB2 canal and were divided into symmetrical (presence/absence of the canal in the right and left 1MMs) and asymmetrical. The diagnosis of periapical lesion was made in obturated teeth. Results: In G1, symmetry was 78.79% and in 178 (67.42%) cases the presence of the MP canal was found bilaterally. In G2, symmetry was observed in 198 (68.5%) of the exams analyzed and in 153 (52.9%) the MB2 canal was visualized in both molars. A statistically significant difference was found between the two groups, with a higher probability of asymmetric cases in G2. As for the presence of periapical lesions, in 63.7% of the cases, images suggestive of periapical lesions were observed, and the presence of filling material in the root canal may have made it harder to visualize MB2 canal, thus, the evaluation of the homologous, when possible, could help in the diagnosis.

Key words: Molars. Root Canal. Cone-beam Computed Tomography. CBCT.

LISTA DE SIGLAS E ABRAVIATURAS

1MS – primeiro molar superior

1MM – *maxillary first molar*

CBCT – *cone-beam computed tomography*

FOV – *field of view* (campo de visão)

MP – mesiopalatino

MB2 – *mesiobuccal second canal*

MV – mesiovestibular

MB - *mesiobuccal*

Micro-CT – *microcomputed tomography* (microtomografia computadorizada)

TCFC – tomografia computadorizada de feixe cônico

TCFL – tomografia computadorizada de feixe em leque

G1 – grupo 1 (1MSs não obturados X 1MSs não obturados)

G2 – grupo 2 (1MSs obturados X 1MSs homólogos não obturados)

G2U – grupo 2 com 1MSs não obturados

G2O – grupo 2 com 1MSs obturados

SUMÁRIO

INTRODUÇÃO

Os primeiros molares são os dentes que mais recebem tratamentos endodônticos e os menos compreendidos em suas peculiaridades (BARATTO FILHO et al., 2009; CLEGHORN; CHRISTIE; DONG, 2006; POORNI; KUMAR; INDIRA, 2008). Especificamente em relação aos primeiros molares superiores (1MSs), estes consistem em um grupo de dentes com três raízes na maioria dos casos, sendo uma palatina e duas vestibulares, e cada uma possuindo ao menos um canal radicular. No entanto, a presença de um segundo canal na raiz mesiovestibular (MV), o canal mesiopalatino (MP), é bastante frequente, com sua prevalência variando entre 30,9% e 97,6% (JING et al., 2014; MARTINS, 2019; MARTINS et al., 2019; ZHANG et al., 2017; ZHENG et al., 2010; ESTRELA et al., 2015; REIS et al., 2013; SILVA et al., 2014; ZHANG et al., 2011).

Estudos sobre prevalência da anatomia do canal radicular realizados em tomografia computadorizada de feixe cônico (TCFC) foram avaliados em uma revisão sistemática de literatura. A busca foi feita em seis bases de dados eletrônicas e em três periódicos endodônticos revisados por pares. O mérito científico dos textos completos foi avaliado com a ferramenta *Joanna Briggs Institute´s Critical Appraisal Checklist for Studies Reporting Prevalence Data* (INSTITUTE, 2014). Após a análise, 52 artigos foram incluídos na revisão trazendo informações da anatomia do sistema de canais de 102.610 dentes. Em relação aos 1MSs, observou-se uma variação na prevalência do canal MP entre 30,9 e 96,7%, mas a tendência geral dos estudos mostrou que a presença do MP era mais frequente que a ausência (MARTINS et al., 2019).

A regionalidade exerce um papel de destaque nesta ampla variação de prevalência, como mostra Martins et al. (2018) em um amplo estudo multicêntrico que avaliou a prevalência do canal MP em 1MSs em 21 países diferentes, além da influência de vários fatores, como idade, sexo, número de raízes e lado. Na busca pela padronização no diagnóstico, os 21 examinadores foram previamente orientados pelo pesquisador principal e calibrados até que uma substancial concordância entre os examinadores fosse obtida. A amostra era de 250 1MSs por região, totalizando 5.250 1MSs analisados. As amostras não eram compatíveis em relação à idade e sexo. Foram aceitas imagens de qualquer tomógrafo e FOV, mas com tamanho de voxel de no máximo 0,250 mm. O resultado mostrou uma variação enorme da

prevalência do canal MP nos diferentes países, indo de 48% na Venezuela até 97,6% na Bélgica, indicando a influência da regionalidade. Assim como observaram maior prevalência nos homens e também em pessoas mais jovens (MARTINS et al., 2018).

Em uma recente revisão sistemática de literatura e metanálise de estudos de prevalência do canal MP em molares superiores com TCFC, os autores buscaram avaliar a influência do tamanho do voxel e de aspectos demográficos da população, como idade, sexo e região geográfica, na prevalência do canal MP em primeiros e segundos molares superiores. Após uma extensa busca em quatro bases de dados eletrônicas e cinco periódicos endodônticos revisados por pares, nos últimos 30 anos, 26 estudos foram incluídos, totalizando dados de 15.285 1MSs. A prevalência do MP nos 1MSs foi de 69,9%, e os homens têm mais chance de ter o canal MP do que as mulheres. A regionalidade também afetou a prevalência, já a idade e o tamanho do voxel não, ressaltando que somente trabalhos com voxel máximo de 0,200 mm foram incluídos, baseados nos resultados de prévia pesquisa. (VIZZOTTO et al., 2013; MARTINS, 2019)

Tabela 1: Síntese de dados de prevalência do canal MP em estudos em TCFC

Autor (ano)	Voxel (mm)	População	n	Canal MP (%)
Zheng et al. (2010)	0.125	Chinesa	775	52.4
Lee et al. (2011)	0.167	Coreana	458	71.8
Zhang et al. (2011)	0.125	Chinesa	299	52
Kim et al. (2012)	0.167	Coreana	803	63.59
Plotino et al. (2013)	n/e	Italiana	161	40.3
Reis et al. (2013)	0.200	Brasileira	158	88.5
Jing et al. (2014)	0.125	Chinesa	612	30.9
Silva et al. (2014)	0.200	Brasileira	314	42.6
Estrela et al. (2015)	0.100	Brasileira	100	78
Naseri et al. (2015)	0.200	Iraniana	149	86.6
Betancourt et al. (2016)	0.120	Chilena	550	69.82
Martins et al. (2016)	0.200	Portuguesa	542	71
Tian et al. (2016)	0.160	Chinesa	1500	57.8
Martins et al. (2018)	0.200 (mín)		5250	73.8
Martins et al. (2019)	0.200 (mín)		15285	69.6

| Tzeng et al. (2019) | 0.250 | Chinesa | 670 | 79.2 |

Ainda que a anatomia do sistema de canais do 1MS seja amplamente estudada e conhecida, a dificuldade na realização do tratamento endodôntico permanece, e a presença do canal MP parece ser a principal causa de falhas deste procedimento, criando a necessidade do retratamento endodôntico (COELHO et al., 2018; IQBAL, 2016; KARABUCAK et al., 2016; SONG et al., 2011; TABASSUM; KHAN, 2016; WOLCOTT et al., 2002, 2005).

Wolcott et al. (2005) buscaram investigar a incidência do canal MP em molares tratados e retratados endodonticamente. A busca pelo canal MP era feita no momento do retratamento utilizando magnificação. Foram tratados 3578 1MSs por seis endodontistas em um período de cinco anos. O canal MP só era considerado presente quando sua obturação era possível até o ápice ou quando ele se unia ao MV próximo ao ápice. Foi observado um aumento na incidência do MP no retratamento. No tratamento inicial, 57,9% dos 1MSs apresentaram o MP, já no retratamento este valor subiu para 66%. Os autores sugeriram que a falha na localização e tratamento do canal MP diminuiria o prognóstico a longo prazo.(WOLCOTT et al., 2005)

Buscando elucidar as causas que levam às falhas do tratamento endodôntico, Song et al. (2011) avaliaram 557 dentes com periapicopatia por magnificação (26x) durante a cirurgia paraendodôntica. As prováveis causas foram classificadas em: canal não tratado; infiltração pelo material obturados; cálculo apical; complexidade anatômica; subobturação; fraturas ou trincas; iatrogenias; sobreobturação; e causas desconhecidas. As causas mais frequentes observadas foram a infiltração pelo material obturador e a presença de canais não tratados. Especificamente no grupo dos molares superiores, a causa mais frequente foram os canais MP não tratados previamente (45,90% das falhas). Os autores apontam que isso poderia ser evitado ao se observar melhor as características anatômicas deste grupo de dentes e fazer uso de instrumentos de magnificação durante o tratamento (SONG et al., 2011).

Investigar a provável causa do insucesso é fundamental para que se obtenha sucesso no novo tratamento, e a TCFC pode auxiliar o profissional nesta busca (KARABUCAK et al., 2016; KRUSE et al., 2018; RODRÍGUEZ et al., 2017). Embora a TCFC seja um instrumento de diagnóstico por imagem recomendado para casos de tratamento endodôntico de dentes com morfologia complexa (EUROPEAN SOCIETY OF ENDODONTOLOGY et al., 2014; SPECIAL COMMITTEE TO REVISE THE JOINT

AAE/AAOMR POSITION STATEMENT ON USE OF CBCT IN ENDODONTICS, 2015), e válido na detecção do canal mesiopalatino em molares superiores (ABUABARA et al., 2013; BLATTNER et al., 2010; MARTINS, 2019; PARKER et al., 2017; ZHENG et al., 2010), ela apresenta certas limitações de diagnóstico quando da presença de materiais de alta densidade na região investigada. Coroas protéticas, pinos e núcleos metálicos, implantes e material obturador endodôntico geram artefatos de imagem que dificultam de maneira significativa a visualização da região onde se encontram (CODARI et al., 2017; SCHULZE et al., 2011; VIZZOTTO et al., 2013, 2015).

Vizzotto et al. (2013) verificaram a influência do tamanho do voxel (0,200mm, 0,250mm e 0,300mm) e do material obturador endodôntico na detecção do canal MP em TCFC em dentes que apresentavam o canal mesiovestibular obturado. Para dentes com canais não obturados não houve diferença significativa, então o voxel de 0,300 mm foi sugerido por fornecer menor dose de radiação. O voxel 0,200mm foi o mais adequado para a identificação do MP quando o canal MV estava obturado. A presença de material obturador no canal MV reduziu a capacidade de visualização do MP, especialmente nos exames com voxel de tamanhos 0,250mm e 0,300mm. (VIZZOTTO et al., 2013)

Utilizando exames de TCFC de FOV restrito e voxel de 0,076 ou 0,125 mm, Karabucak et al. (2016) examinaram 1137 pré-molares e molares com tratamento de canal. O objetivo era avaliar a incidência de canais não tratados e o seu efeito no prognóstico endodôntico. Nos resultados, foi possível observar que os 1MSs foram os dentes com a mais alta incidência de canais não tratados e que o canal MP foi o responsável por 65% dos casos. Também observaram alta incidência de lesão periapical nos dentes com canais não tratados. Embora tenham sido excluídos os casos com muitos artefatos de imagem, os autores ponderam que canais não tratados muito próximos do material obturador dos demais condutos podem não ter sido corretamente identificados. (KARABUCAK et al., 2016)

A frequente similaridade do número de canais em 1MSs homólogos vem sendo observada em diversos estudos, em diferentes populações pesquisadas (LEE et al., 2011; MARTINS et al., 2018; PLOTINO et al., 2013; RATANAJIRASUT; PANICHUTTRA; PANMEKIATE, 2018; TZENG et al., 2019; ZHANG et al., 2011, 2017; ZHENG et al., 2010). Zheng et al. (2010) observaram a presença do canal MP

bilateralmente nos 1MSs em 71,1% da amostra (ZHENG et al., 2010). Valor bem próximo aos 73,4% de pacientes com o MP presente em 1MSs homólogos encontrado por Lee et al. (2011) (LEE et al., 2011).

Já Plotino et al. (2013), utilizando exames de TCFC, descreveram a similaridade do sistema de canais dos 1MSs com mais detalhes. A presença do canal MP bilateralmente foi observada em 33,3% da amostra, mas a simetria do sistema de canais ainda foi alta, presente em 71,1% dos casos. 37,8% apresentavam um único canal na raiz MV. (PLOTINO et al., 2013)

Zhang et al., (2017) avaliaram tomografias de 460 pacientes que apresentavam 1MSs bilaterais não tratados e observaram simetria no número de canais em 95,2% dos casos (ZHANG et al., 2017). Ratanajirasut, Panichuttra e Panmekiate (2018) encontraram o canal MP em 215 pacientes, dos 266 avaliados e em 80,93%(174) ele se apresentava bilateralmente (RATANAJIRASUT; PANICHUTTRA; PANMEKIATE, 2018).

Em estudo recente (TZENG et al., 2019), foram avaliadas imagens de TCFC de pacientes que apresentavam os 1MSs em condições de análise. Os exames foram avaliados por dois endodontistas de forma cega com base na classificação de Weine (WEINE et al., 1969). A configuração anatômica de três raízes e 4 canais radiculares (2 na raiz MV) foi a de maior prevalência, encontrada em 74% dos 846 dentes avaliados. Homens tiveram maior probabilidade de apresentar o canal MP. A simetria dos canais radiculares foi observada em 87,36% dos pacientes. O canal MP foi encontrado bilateralmente em 77,80% dos casos (85,71% dos homens e 71,28% das mulheres).

OBJETIVOS

Objetivo geral

Avaliar em TCFC a simetria do número de canais da raiz MV de 1MSs, a presença de lesões periapicais em 1MSs com condutos obturados e a relação com a presença do canal MP em sua raiz MV e também de seus homólogos não obturados. Ainda, verificar se há influência do material endodôntico na detecção do canal MP em 1MSs tratados endodonticamente tendo como referência seus homólogos não obturados.

Objetivos específicos

1.   Verificar a prevalência do canal MP, assim como sua relação com a idade ou sexo.

2.   Comparar a simetria do número de canais da raiz MV de 1MSs homólogos quando da presença ou não de tratamento endodôntico.

3.   Avaliar a presença de imagens sugestivas de lesões periapicais em 1MSs com condutos tratados endodonticamente e a relação com a presença do canal MP em sua raiz MV e também de seus homólogos não obturados.

4.   Verificar a presença do canal MP no 1MS homólogo não tratado por meio de TCFC, e então tentar localizar o MP no 1MS obturado também em TCFC.

ARTIGO 1

COMPARISON OF SYMMETRY OF THE NUMBER OF MESIOBUCCAL ROOT
CANALS BETWEEN OBTURATED AND UNTREATED MAXILLARY FIRST
MOLARS: A CBCT STUDY

ABSTRACT

Introduction: There are limitations caused by imaging artifacts generated by root canal filling material, pins, crowns or extensive restorations in CBCT scans. The aim of this study was to compare the similarity in the number of root canals in mesiobuccal root (MB) of maxillary first molars (1MMs) in two groups of patients scans, one with 1MMs without root canal treatment (untreated) and the other with patients with one obturated 1MM and the homologous untreated in CBCT. Methods: The sample consisted of 553 tomographic exams of patients who presented bilateral 1MMs. The exams were divided into two groups, G1 (Untreated X Untreated) and G2 (G2: Untreated X obturated). Five experienced examiners in CBCT evaluated the images. The presence/ absence of MB2 canal was classified based on a Likert Scale. Results: The similarity of the number of canals was observed in 208 (78.79%) exams in G1. Bilateral identification of the MB2 canal was observed in 178 (67.42%) scans and in 30 (11.36%) there was bilateral identification of only one canal. In G2, symmetry was observed in 198 (68.5%) exams. In 153 (52.9%) the MB2 canal was visualized in both molars, while in 45 (15.5%) the MB2 canal was not visualized bilaterally. Asymmetry of the number of canals was observed in 91 (31.48%) cases. Conclusion: There is greater simultaneous detection of MB2 root canal between untreated 1MMs, suggesting a false asymmetry in obturated 1MMs due to non-visualization of MB2 canal.

INTRODUCTION

Endodontic treatment outcomes could be affected by different causes. The search for this cause must be relentless in endodontic retreatment, so that the chances of another failure decrease. The maxillary first molars (1MMs) have had their anatomy exhaustively studied, especially due to the presence of a second canal in the mesiobuccal root (MB), the second mesiobuccal canal (MB2) (1,2). A missed MB2 canal is still pointed out as one of the main causes of treatment 's failure (3–9).

When endodontic retreatment is required, many resources could be useful to investigate a missed MB2 canal, such as periapical radiographs, operating microscope, ultrasound and cone beam computed tomography (CBCT), (6,7,10,11). Limited field of view (FOV) CBCT is the choice image for diagnosis of complex morphology teeth, such as 1MMs (12). Although it is difficult to determine the effect of high-density materials near the investigated region, such as obturator material, pins, crowns or extensive metal restorations, on diagnosis due to the imaging artifacts generated by CBCT scans (11,13,14). Unless root canal filling is removed prior to the exam, as Vizzotto et al (2013) suggested, this difficulty in endodontic diagnosis seems to be a constant.

The frequent bilateral symmetry of the root canal configuration in 1MMs has been observed in several studies, in different populations surveyed (15–22). Tzeng et al. (2019) suggested that when the MB2 canal is present, professional should strongly consider the possibility of its existence also in homologous molar.(19)

Considering the probable symmetry of the number of MB root canals of homologous 1MM, the goal of this study was to compare the similarity of the number of root canals in MB root of 1MMs in two groups of patients scans, one with 1MMs without root canal treatment (untreated) and the other with patients with one obturated 1MM and the homologous untreated in CBCT.

MATERIALS AND METHODS

The Research Commission of the Federal University of Rio Grande do Sul under the opinion nº 1,213,390 approved this cross-sectional study.

Sample selection and CBCT images acquisition

The sample consisted of tomographic exams belonging to the database of a private dental radiology center in Porto Alegre, Brazil. They were performed over a period of two years, from 2014 to 2016, for various clinical indications. No patient underwent CBCT for research purposes and the anonymity of patients was assured. The CBCT device used was the i-CAT Next Generation model (Imaging Sciences International, Inc., Hatfield, PA, USA, 120 kVp, 5 mA), voxel size of 0.2 mm, FOV of 16 cm in diameter and variable height between 5 and 13 cm, with a 27 seconds time of scanning.

CBCT scans should present maxillary molars bilaterally and at least one without endodontic treatment to be included. Exclusion criteria were fractures or root perforations, the presence of extensive restorations, prostheses or coronary destruction, and the MB2 canal previously filled.

For symmetry comparison, the sample was divided into two groups, one with both 1MMs without endodontic treatment (G1: untreated X untreated) and the other presenting one of 1MMs with endodontic treatment (G2: untreated X obturated). The MB2 canal prevalence was calculated in untreated 1MMs.

Image evaluation

Five experienced examiners in CBCT, four specialists in Oral Radiology, trained and calibrated evaluated the images. Three examiners evaluated G1 and three G2 exams. One researcher was present in both groups evaluation. A 22" LCD monitor with a resolution of 1680 x 1050 pixels (AOC Brazil, São Paulo, SP, Brazil) was used, and the images were evaluated in the axial, coronal, and sagittal planes using the XoranCAT v.3.1.62 program (Xoran Technologies, Ann Arbor, MI, USA), in a low-light environment. The examiners described the presence or absence of MB2 canal in MB root according to a five-point Likert scale, where score 1 was the certainty of MB2 visualization and 5 the certainty of non-visualization. For cases where there was no agreement among the examiners, a new assessment session was conducted with all examiners until a consensus was reached. In G1, each tooth in the split mouth was analyzed at different times so that there was no influence on the assessments, ensuring the blinding and reliability of results. In G2, both 1MMs were analyzed in

sequence, first the untreated, followed by the obturated. Prior to the evaluation sessions, the calibration of the evaluators was tested in 60 exams that were analyzed repeatedly and the Kappa obtained was 0.82.

Statistical analysis

Double typing, review and database analysis were performed in the SPSS program, version 18.0. [SPSS Inc. Released in 2009. PASW Statistics for Windows, version 18.0. Chicago: SPSS Inc.] Normally distributed quantitative data according to the Shapiro-Wilk test were expressed as mean ± standard deviation of the mean (±DP), while not normally distributed data were expressed as median and interquartile range [25 to 75 percentiles, P25-P75]. Qualitative variables were described as absolute (n) and relative (%) frequencies. Comparisons between medians were conducted by Mann-Whitney test, while the proportions between categories were compared by Chi-square test with adjusted residual analyses. Spearman correlations were conducted between interest variables. The significance level was set at 5% for all analyses. Intra- and inter-examiner agreement was verified by the Kappa index.

RESULTS

From the database of 10,764 scans, 553 were selected (331 women and 222 men), 264 in G1 and 289 in G2, totaling 1,106 1MMs evaluated, 817 untreated and 289 obturated (figure 1). The median [P25 - P75] age of G1 (41.00[25.00 - 55.00]) was lower than G2 (51.00[43.00 - 58.00]) (Mann-Whitney test, p≤0.0001). Additionally, group 1 was associated with a higher frequency of male participants (48.5%) in relation to group 2 (32.5%), while group 2 was associated with a higher frequency of female participants (67.5%) (Chi-square Test, p≤0,0001).
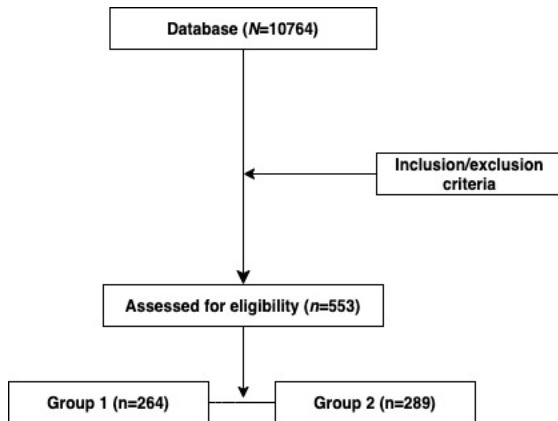
Figure 1. Exam selection flowchart. Legend: n - absolute frequency.

Intra-examiner reproducibility was over 0.75 for all evaluators. For the concordance analysis between the examiners, the variables MB2 canal visualization were dichotomized as follows: the interpretations: " certainly visualizes" and "probably visualizes" the MB2 canal were classified as "visualized", and the interpretations "uncertain", "probably not visualized" and "certainly not visualized" were classified as not visualized.

The similarity of MB root canals between right and left sides was observed in 406 scans (73.41%). In G1, symmetry was 78.79%, and in 178 (67.42%) cases the presence of the MB2 canal was observed bilaterally, and in 30 (11.36%) its absence was observed bilaterally. In G2, symmetry was observed in 198 (68.5%) of the analyzed tests. In 153 (52.9%) the MB2 canal was visualized in both molars and in 45 (15.5%) the MB2 canal was not visualized bilaterally. Asymmetry of the number of canals was observed in 91 (31.48%) cases (Table 1).

Table 1. Symmetry of mesiopalatine canal (MB2) in G1 and G2.

MB2 Distribution	Total (N=553)	Group 1 (n=264)	Group 2 (n=289)	*p-value
Asymmetrical	147(26.68)	56(21.21)	**91(31.48)**	**0.008**
Symmetrical	406(73.41)	**208(78.79)**	198(68.51)	
Present bilaterally	331(59.85)	178(67.42)	153(52.94)	
Absent bilaterally	75(13.56)	30(11.36)	45(15.57)	

Legend: n - absolute frequency. n% - relative frequency. p - index of statistical significance. *Chi-square test with adjusted residual analysis. Numbers highlighted in bold indicate significant association between the categories by the Chi-square Test with adjusted residual analysis. Statistical significance set at 5% for all analyses.

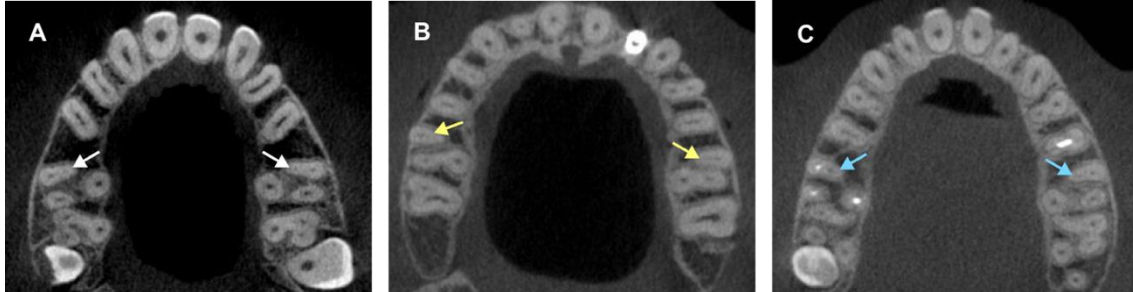In Figure 2, examples of symmetry between homologous maxillary molars in G1 and G2 scans are shown.

Figure 2: Examples of symmetry in the presentation of the mesiopalatine canal (MB2): A and C - symmetric, bilateral presence of the MB2 canal; B - symmetric, bilateral absence of the MB2 canal.

After the exclusion of the obturated 1MMs from G2 to calculate the total MB2 canal prevalence, a total of 817 untreated 1MMs remained (N=817). MB2 canal was visualized in 79.2% (647) of teeth. There was no difference in visualization frequencies (Group 1: 78.0%, Group 2: 81.3%) and non-visualization (Group 1: 22.0%, Group 2: 18.7%) between both groups analyzed (Chi-square test, p=0.310). (Table 2)

Table 2. Frequency of MB2 canal display in the 1MMs not closed.

Variable	Total (N=817)	Group 1 (n=528)	Group 2 (n=289)	*p-value
MB2 visualization– n(n%)				
No	170(20.8)	116(22.0)	54(18.7)	0.310
Yes	647(79.19)	412(78.0)	235(81.3)	

Legend: n - absolute frequency. n% - relative frequency. p - index of statistical significance. *Chi-square test with adjusted residual analysis. Statistical significance set at 5% for all analyses.

When we dichotomized Group 2 into untreated1MMs (Group 2U) and obturated 1MMs (Group 2O), and compared them to Group 1, analyses indicated a difference between the three groups for MB2 canal visualization (Table 3). There was an association of MB2 canal visualization in the untreated 1MMs (Groups 1 and 2U) and non-visualization in the untreated 1MM group(Group 2O) (Chi-square Test, p≤0.0001).

Table 3: Frequency of MB2 canal visualization in the analyzed groups.

Variable		Total (N=1106)	Group 1 (n=528)	Group 2U (n=289)	Group 2O (n=289)	*p-value
MB2 visualization– n(n%)						
	No	297(26.9)	116(22.0)	54(18.7)	**127(43.9)**	1
	Yes	809(73.1)	**412(78.0)**	**235(81.3)**	162(56.1)	

Legend: n - absolute frequency. n% - relative frequency. p - index of statistical significance. *Chi-square test with adjusted residual analysis. Numbers highlighted in bold indicate significant association between the categories by the Chi-square Test with adjusted residual analysis. Statistical significance set at 5% for all analyses.

Correlations between MB2 canal visualization, gender, and age are shown in Table 4. No significant relationship was observed between the variables (Spearman correlation, p>0.05 for all variables).

Table 4. Correlations between the variables of interest.

Variable	MB2 visualization (N=817)	
	r_S	*p-value
Age (years) [#]	-0.031	0.375
Men	0.023	0.506

[#] N=814. Legend: n - absolute frequency. rS - Spearman correlation coefficient. p - statistical significance index. *Spearman correlation test. Statistical significance fixed at 5% for all analyses.

DISCUSSION

CBCT has been shown to be a valuable diagnostic resource for Endodontics (1,2,12,23). But few studies have evaluated the influence of obturated canals on the diagnostic ability of the MB2 canal in CBCT (10,11) and none of them in vivo. The difficulty appears especially in cases where the canal identification is not possible at CBCT, and it is up to the clinician to decide to use other diagnostic tools in order to elucidate the issue, so that no further failure occurs. With the results of this study, we detected less visualization of MB2 canal in obturated 1MMs, when compared with its untreated homologous, thus the symmetry of the number of canals in G2 was statistically lower than in G1, due to the 91 asymmetric cases observed.

The frequent symmetry of the number of MB root canals in 1MM homologous has been pointed out by several studies (15,17–22,24,25), agreeing with the results of this research, which found similarity in 73.41% of the cases. This value rises to 78.81% when considering only the group with 1MMs untreated, which makes the comparison with the results of other studies more appropriate, since the presence of sealing material in the root canals is a common exclusion criterion of studies that evaluated the frequency and similarity of the presence of the MB2 canal (15,16,18–22,24–26,26,27).

In a meta-analysis that assessed CBCT accuracy in the diagnosis of dental fractures, Long et al (2014) observed that sensitivity was statistically higher for teeth without root canal treatment and that the chances of false negative were significantly higher in obturated teeth (23). This is in agreement with the results presented here, they showed lower frequency of MB2 visualization in obturated 1MMs, with a statistically significant difference for the 1MM obturated.

The literature presents some studies reporting the presence of in vivo MB2 canal with percentages ranging from 30.9% to 97.6% (1,2,15–17,20–22,25,28–34). The results of this study showed the presence of MB2 canal in 79.19% of cases, very close to the findings of Martins et al (2018) (16), Reis et al (2013) (33) and Estrela et al. (2015) (29), studies also conducted in Brazilian populations, and agreeing with most of the literature that indicates the existence of MB2 canal is more common than its absence (1). (Table 5) The relevance of these data lies in the fact that, although clinical and radiographic detection of the MB2 canal is not always possible, it is necessary to further investigate it with different diagnostic strategies, such as operative microscopy and, if necessary, the use of CBCT scans, considering the high rate of its occurrence.

Table 5: Synthesis of MB2 canal prevalence data in CBCT studies

Author (year)	Voxel (mm)	Country	n	MB2 canal (%)
Present study (2020)	0.200	Brazil	817	79.19
Zheng et al. (2010)	0.125	China	775	52.4
Lee et al. (2011)	0.167	Korea	458	71.8
Zhang et al. (2011)	0.125	China	299	52
Kim et al. (2012)	0.167	Korea	803	63.59
Plotino et al. (2013)	n/e	Italy	161	40.3
Reis et al. (2013)	0.200	Brazil	158	88.5
Jing et al. (2014)	0.125	China	612	30.9
Silva et al. (2014)	0.200	Brazil	314	42.6
Estrela et al. (2015)	0.100	Brazil	100	78
Naseri et al. (2015)	0.200	Iran	149	86.6
Betancourt et al. (2016)	0.120	Chile	550	69.82
Martins et al. (2016)	0.200	Portugal	542	71
Tian et al. (2016)	0.160	China	1500	57.8
Martins et al. (2018)	0.200 (mín)		5250	73.8
Martins et al. (2019)	0.200 (mín)		15285	69.6
Tzeng et al. (2019)	0.250	China	670	79.2

The results presented showed no significant correlation between sex and frequency of MB2 canal visualization, which contradicts some studies that show that the prevalence of the MB2 canal in men is higher than in women (1,16,28,31), but it is in agreement with others that did not observe this influence (15,22,32,33). No correlation was observed between age and MB2 canal presence, agreeing with several studies presented in the literature (1), but contradicting others that showed less presence of this structure in older patients (16,22,33,35). Despite the sample in both groups was not paired for age and gender, the only criterion that influenced results was the root canal filling, since the prevalence of the MB2 canal was similar between the untreated 1MM and statistically lower in the obturated1MM .

CONCLUSION

There is greater simultaneous detection of MB2 root canal between untreated 1MMs, suggesting a false asymmetry in obturated 1MMs due to non-visualization of MB2 canal.

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ARTIGO 2

EVALUATION OF THE FREQUENCY OF PERIAPICAL LESION AND MB2 CANAL

IN OBTURATED MAXILLARY FIRST MOLARS, WITH REFERENCE TO ITS

UNTREATED HOMOLOGOUS: A CBCT STUDY

ABSTRACT

Aim: To evaluate in CBCT the presence of suggestive images of periapical lesions in 1MMs with root canal filling material and the relationship with the presence of MB2 canal. And determine whether the endodontic filling influenced MB2 canal detection in obturated 1MMs. Methodology: The database of a radiology clinic was used and tomographic examinations of 289 patients with obturated1MMs and their untreated homologous were selected and evaluated for three experienced examiners. MB2 visualization was classified according to a five-point Likert scale that indicated the degree of certainty in the visualization of this canal. The lesion suggestive image was evaluated in obturated 1MMs and classified in absent or present. Results: Suggestive periapical lesion images were observed in 63.7% of the obturated 1MM. In obturated 1MMs with lesion (n=184), MB2 canal was visualized in 103 cases and in 150 cases in their homologous. There was an association between the MB2 canal visualization and non-visualization between obturated and untreated 1MMs. Conclusions: The prevalence of periapical lesions in the obturated 1MMs was high; the presence of filling material in the root canal difficults MB2 visualization in CBCT; nonetheless, the homologous evaluation, if possible, can help MB2 investigation.

Key words: Molars. Root Canal. Cone-Beam Computed Tomography. CBCT.

INTRODUCTION

First molars are the most endodontically treated teeth and the least understood in their peculiarities (1–3). Specifically, in maxillary first molars (1MMs), the usual anatomic configuration is three roots, one palatal and two buccal, and at least one canal per root. However, a second canal in mesiobuccal root (MB), the mesiobuccal canal (MB2), is quite frequent, with its prevalence varying between 30.9% and 97.6% (4–13).

Although 1MM canal system is widely studied and known, the difficulty in performing endodontic treatment remains, and the presence of MB2 canal seems to be an important cause of failure of this procedure, creating the need for endodontic retreatment (14–16). Investigating the probable failure cause is fundamental for retreatment success and Cone-Beam Computed Tomography (CBCT) can help professional in this search (17,18). Although CBCT is a recommended diagnostic imaging tool for endodontic treatment of complex morphology teeth (19,20), and valid for the detection of MB2 canal , it presents certain diagnostic limitations when high-density materials are nearby the investigated region. Prosthetic crowns, metal pins and cores, implants and endodontic obturation material generate image artifacts that make it significantly difficult to visualize the region around them. (24–26).

The aim of this study was to evaluate the presence of suggestive images of periapical lesions in obturated 1MMs and the relationship with the presence of MB2 canal. And determine whether the endodontic filling influenced MB2 canal detection in obturated 1MMs

MATERIALS AND METHOD

A cross-sectional study was conducted, approved by the Research Commission of the Federal University of Rio Grande do Sul under the opinion No. 1,213,390. The sample consisted of CBCT exams from the archive of a private dental radiology clinic, performed between 2014 and 2016, for different clinical indications. Inclusion criteria were scans of patients with obturated 1MMs and their homologous untreated. Exclusion criteria were examinations of patients with incomplete rhizogenesis of molars; root fractures or perforations; extensive restorations, prostheses or coronary

destruction; metal pins or implants in molars and premolars region; obturated MB2 canal; uncertainty of the bilateral presence of 1MMs.

The CBCT device used for image acquisition was the i-CAT Next Generation model (Imaging Sciences International, Inc., Hatfield, PA, USA, 120 kVp, 3-8 mA). A protocol with a voxel size of 0.200 mm, FOV of 16 cm in diameter and variable height between 5 and 13 cm, and a scanning time of 27 seconds was used for the acquisition of the images.

The CT images evaluated for the study were reconstructed with XoranCAT v.3.1.62 (Xoran Technologies, Ann Arbor, MI, USA) and evaluated by three trained and calibrated examiners on a 22" LCD monitor with resolution of 1680 x 1050 pixels (AOC Brazil, São Paulo, SP, Brazil), in a controlled light environment. The examiners evaluated the images in axial, coronal and sagittal planes and were able to use all the tools and image filters provided by the program whenever they felt the need. MB2 visualization was classified according to a five-point Likert scale that indicated the degree of certainty in the visualization of this canal, with degree 1 certainly visualizing the MB2 and 5 certainly not visualizing the MB2. The calibration consisted of prior analysis of 60 randomly selected sample scans. Intra- and inter-examiner agreement were treated by the Kappa index and the minimum accepted value was 0.7.

The lesion suggestive image was evaluated in obturated 1MMs and classified in absent or present, without specification by root. A periapical radiolucency area with a diameter greater than 0.5 mm was considered a lesion, as suggested by Estrela et al (2008) (27).

The data analysis was performed in the SPSS program, v. 18 (SPSS Inc. PASW Statistics for Windows, v.18 Chicago: SPSS Inc.). The continuous variables were expressed as mean and standard deviation ($\pm$ SD), defined by the Shapiro-Wilk normality test. Categorical variables were described by absolute (n) and relative (n%) frequencies, and the possible associations evidenced by the Chi-square test with adjusted residual analysis. The Spearman ρ coefficients (rS) were estimated to determine correlations between variables of interest. The reliability of analysis between evaluators and the agreement between the different evaluators were conducted by Cronbach's and Kappa's alpha indices, respectively. The significance level adopted for all analyses was set at 5.

RESULTS

From a database of 10,764 CT scans, 392 tests were selected that met inclusion criteria. In the eligibility analysis, 82 (20.9%) were excluded for presenting image artifacts next to the evaluated area (n=71) and uncertainty of the presence of bilateral 1MM (n=11). Of the remaining 310 CT scans, 20 (6.5%) were excluded for presenting MB2 canal already obturated and 1 (0.3%) for inconsistent data during radiographic analysis, resulting in 289 CT scans in the final sample, as shown in Figure 1.
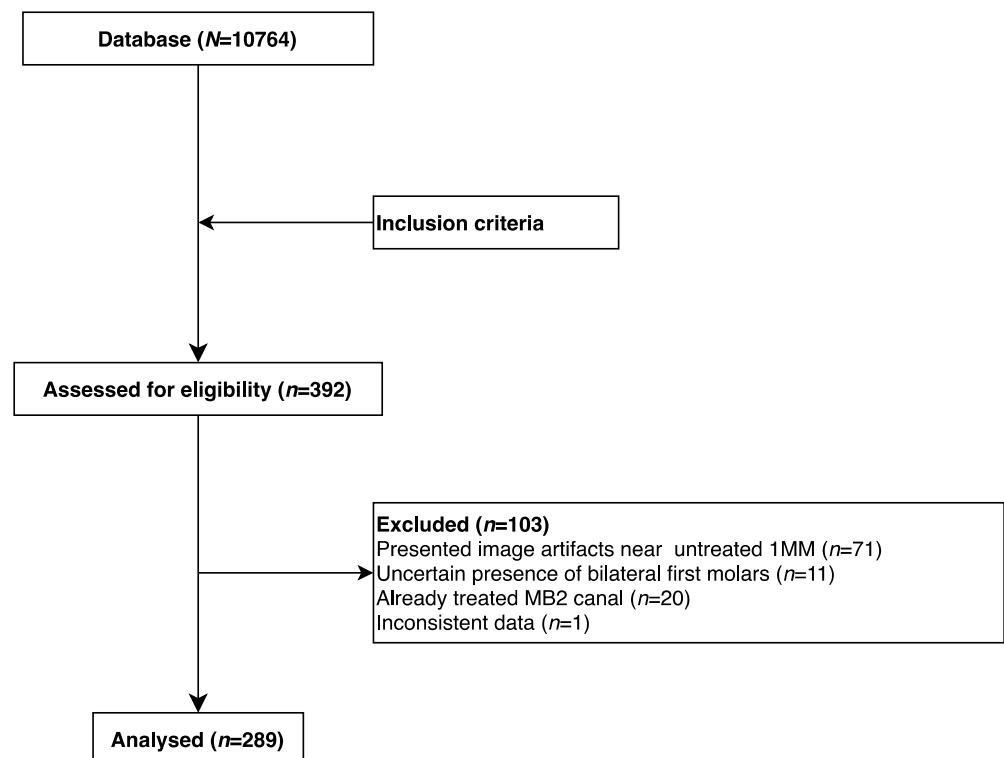

Figura 1. Fluxograma de seleção dos exames. Legenda: n – frequência absoluta.

Of the 289 examinations in the sample, 195 (67.5%) were female and 94 (32.5%) male, the mean age (±SD) was 50.72 ±12.49 years. From the total, 149 (51.6%) tomographic examinations had the left 1MM obturated, while 140 (48.4%) had the right 1MM obturated. (Table 1)

Table 1. Sample characterization.

Variable	Total (N=289)
Age (years) – medium ± SD	50.72 ± 12.49
(minimum – maximum)	(20.00 – 83.00)
MI – n(n%)	3(1.0)
Sex – n(n%)	
Female	195(67.5)
Male	94(32.5)
Obturated 1MM – n(n%)	
First right	140(48.4)
First left	149(51.6)

Legend: SD - standard deviation. MI - missing information. n - absolute frequency. n% - relative frequency. 1MM - maxillary first molar.

Table 2 shows the examiners' assessment for presence/absence of MB2 canal and periapical lesion in 1MM. The reliability of the analysis was verified by Cronbach's alpha values for MB2 canal visualization in untreated and obturated 1MM, and for presence/absence of lesion, obtaining results of 0.949, 0.783 and 0.976, respectively. The results show excellent internal consistency between examiners for the MB2 visualization in untreated 1MM and for presence/absence of lesion, and substantial reliability for MB2 visualization in the obturated 1MM.

Table 2. Reliability and internal consistency analysis between three evaluators for the visualization of the MB2 canal in the obturated 1MM, the presence/absence of injury and the 1MM homologous not treated, based on the Likert scale.

Variable	Examiner 1	Examiner 2	Examiner 3	Cronbach Alpha
Obturated 1MM – n(n%)				
Surely you can see	100(34.6)	109(37.7)	64(22.1)	
It's probably visualized	76(26.3)	82(28.4)	51(17.6)	
Uncertain	23(8.0)	21(7.3)	8(2.8)	0.783
You probably can't see	59(20.4)	60(20.8)	112(38.8)	
Surely you can't see	31(10.7)	17(5.9)	54(18.7)	
Lesion – n(n%)				
No	106(36.7)	104(36.0)	95(32.9)	0.976
Yes	183(63.3)	185(64.0)	194(67.1)	
1MM untreated homologous– n(n%)				
Surely you can see	154(53.3)	18(54.7)	177(61.2)	
It's probably visualized	78(27.0)	77(26.6)	65(22.5)	
Uncertain	3(1.0)	4(1.4)	0(0.0)	0.949
You probably can't see	29(20.0)	42(14,5)	41(14.2)	
Surely you can't see	25(8.7)	8(2.8)	6(2.1)	

Data presented as absolute (n) and relative (n%) frequencies. Legend: n - absolute frequency. n% - relative frequency. MB2 – second mesiobuccal canal.

For agreement between the examiners, the variables of MB2 canal visualization were dichotomized as follows: the interpretations "you certainly visualize" and "you probably visualize" the MB2 canal were classified as "visualized", and the interpretations "uncertain", "you probably do not visualize" and "you certainly do not visualize" were classified as not visualized. Both MB2 canal visualization in untreated 1MM and lesion showed excellent agreement among examiners (Kappa Index ≥0.860). For MB2 canal in the obturated 1MM, the agreement was lower (Kappa Index ≈0.473). (Data not presented).

Based on the results of Kappa Index, it was chosen the consensual evaluation between the three observers for classification of the MB2 visualization in obturated and untreated homologous 1MM and lesion visualization (Table 3).

Table 3. Consensus classification between the three examinations for MB2 visualization in obturated 1MM and untreated homologous 1MM and lesion visualization.

Variable	Total (N=289)
Obturated 1MM – n(n%)	
MB2 visualization	162(56.1)
MB2 non-visualization	127(43.9)
Lesion – n(n%)	
Lesion visualization	184(63.7)
Lesion non-visualization	105(36.3)
Untreated homologous 1MM – n(n%)	
MB2 visualization	235(81.3)
MB2 non-visualization	54(18.7)

Data expressed in absolute (n) and relative (n%) frequencies. N=289.

Figure 2 shows MB2 presence/absence in three different situations and how image artifacts can impair evaluation. Additionally, it was observed that there was an association between the frequencies of both MB2 non-visualization and visualization in obturated 1MMs and its untreated homologous (Chi-square test p<0.0001) (Table 4).

Table 4: Associations between frequencies of MB2 visualization and non-visualization in 1MMs treated and 1MMs untreated homologous.

Total (N=289)	Untreated homologous 1MM – n(n%)		*p-value
	MB2 non-visualization	MB2 visualization	
Obturated 1MM – n(n%)			<0.0001
MB2 non-visualization	**45(83.3)**	82(34.9)	
MB2 visualization	9(16.7)	**153(65.1)**	

Data presented as absolute (n) and relative (n%) frequencies. Data highlighted in bold show significant association between the categories by the Chi-square test with adjusted residual analysis.
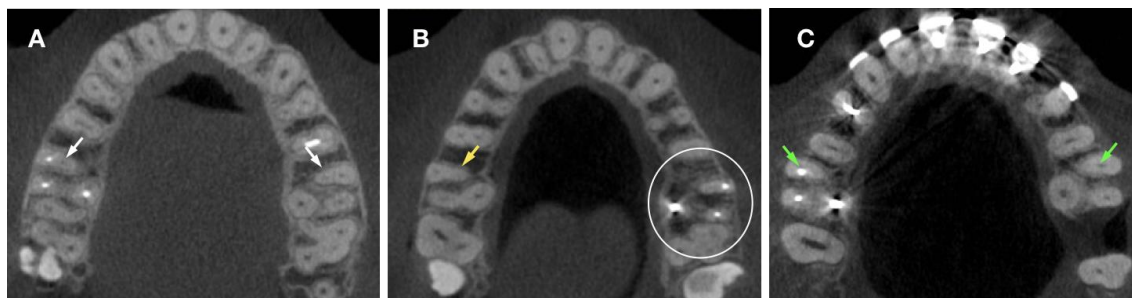
Figure 2: Examples of bilateral MB2 presentation and the difficulty generated by imaging artifacts: A - bilateral presence of MB2 canal (white arrows); B - unilateral presence of MB2 canal (yellow arrow); C - bilateral absence of MB2 canal (green arrows); B and C - observe imaging artifacts.

The correlations between variables are presented in Table 5. The MB2 visualization in obturated 1MM was related to MB2 visualization in untreated homologous 1MM (r_S=0.380, p≤0.0001, data not presented). Additionally, age was negatively related to MB2 visualization for obturated and untreated homologous 1MM (Spearman correlations, r_S=-0.127 p=0.032) (Spearman correlations, r_S=-0.128, p=0.030).

Table 5: Correlations between variables.

Total (N=289)	MB2 visualization – Obturated 1MM		MB2 non-visualization – Untrated homologous 1MM	
	r_S	*p-value	r_S	*p-value
Age	**-0.127**	**0.032**	**-0.128**	**0.030**
Male sex	0.034	0.561	-0.084	0.154

*Spearman's correlations. Legend: N - absolute frequency. rS - Spearman correlation coefficient.

Considering only the cases with periapical lesion in obturated 1MMs (N=184), it was possible to observe MB2 visualization in 103 (55.97%). However, in their untreated homologous, MB2 was visualized in 150 (81.52%) cases. In 65.4% of obturated 1MMs, the visualization of MB2 was not possible, but it was in their untreated homologous. In addition, there was an association between MB2 visualization and non-visualization in obturated and untreated homologous 1MMs. (Chi-square Test, p≤0.0001) (Table 6).

Table 6: Association between periapical lesion visualization in obturated 1MM and MB2 canal visualization in obturated 1MM and untreated homologous1MM.

Variable – n(n%)	Obturated 1MM lesion (N=184)		*p-value
	MB2 non-visualization (N=81)	MB2 visualization (N=103)	
1MM untreated homologous			
MB2 non-visualization	**28(34.6)**	6(5.9)	**≤0.0001**
MB2 visualization	53(65.4)	**97(94.2)**	

*Qui-square test with adjusted residual analysis. Numbers highlighted in bold indicate significant association between the categories.

DISCUSSION

When an endodontic treatment in a 1MM is needed, previous MB2 canal identification is of fundamental importance, since several studies showed its high prevalence, between 30.9% and 97.6% (4–13). This huge variation could be explained by the ethnic difference between populations surveyed (6,8), as well as the different evaluation methods (28,29). In the sample selection, only 20 molars could be observed with the MB2 canal already filled among the 392 initially selected, an amount much lower than the frequency of MB2 described in the literature (4–13).

In this study, MB2 visualization was verified in CBCT scans, with voxel 0.200mm, which the literature has shown to be a reliable diagnostic method for this purpose (8,24,28,29). In obturated 1MMs group, MB2 canal was viewed in 56.1%, while in the untreated 1MMs group, it was in 81.3% of the sample, which corroborates with other CBCT studies done in Brazilians. (4,6). This difference could be explained by the image artifacts produced by sealing material, which made harder to visualize this structure (24–26,28). This difficulty became evident when Kappa Index and Cronbach´s Alpha values of the evaluators were verified, which were lower for 1MMs obturated group, even though they were experienced professionals with properly calibration, corroborating with a previous study by Vizzotto et al (2015) (28).

Mirmohammadi, H *et al* (2015) (30), evaluated the accuracy of CBCT in MB2 canal detection in 60 endodontically treated teeth in an in vitro study. By using a smaller voxel (0.125 mm) and a specific scanning configuration to

improve root canal visualization as suggested by previous research (31), they showed that CBCT could be a tool with excellent accuracy. The authors themselves pointed out that it is not possible to state this for other CT scanners and different scanning configurations. On the other hand, the present study, despite using 0.200 mm voxel, the authors used only scans of patients in which the first maxillary molars were identified on both sides, one being obturating and the other not. This was only possible due to the huge amount of CBCT scans in the evaluated data bank.

It is a fact that MB2 non-identification in endodontic treatment of maxillary molars is one of the main causes of failure, significantly increasing the chance of periapical lesion in these teeth (14,16,32–34). This possibly explains the very high frequency of suggestive periapical lesion images visualized in obturated 1MMs group. Almost two thirds of the exams had some degree of radiolucency associated to the apexes of this tooth, which is not surprising, since no tooth in this sample had the MB2 obturated, although it was visualized in 56.1% of the obturated 1MMs and in 81.3% of the untreated group.

When only those with periapical lesion (n=184) were analyzed, it was found that in 81 cases the MB2 canal was not visualized in the obturated 1MMs. However, the presence of MB2 canal in its untreated homologous was identified at 65.4%. Taking into account the frequent bilateral symmetry of the number of root canal in the 1MM MB root (11–13,35–38) and the difficulties caused by the filling material in CBCT diagnosis (24,26) also found in this survey, there are some questions left. When identification on tomography is not possible, would it be prudent not to insist on clinical investigation in cases of retreatment? Could the tomographic evaluation of the 1MM homologous, when present, help in any way?

The decrease in the prevalence of the MB2 canal with aging is a phenomenon observed in several populations surveyed (6,9,13,39), similar result to the one found in this search. Fact possibly justified by the decrease of pulp space throughout life, caused by continuous deposition of dentin (40,41). Mas que não é um achado unânime, conforme mostra recente revisão sistemática de literatura e metanálise (8), which showed that the prevalence of the MB2 canal remained constant in different age groups. The MB root of 1MM specifically undergoes a lifelong calcification process that can transform a single large canal

into two narrower canals, due to constant mesiodistal dentin apposition in the center of this canal (41). Moreover, age is probably not an isolated factor in the transformations that the pulp space undergoes over time, but it is associated with traumas, habits, carious injuries, etc.

In accordance with this study, other studies found no differences between men and women in the presence of MB2 canal (9,13,35,42). Differently, other surveys showed a predilection for males (6,8,43,44), but only Martins et al. (2019) talked more about the subject, bringing justifications based on anatomic and anthropological studies (8).

The limitations of this study are related to its retrospective character, where the sample was collected from a database. Consequently, the reason for the exam was unknown, as was the patient's clinical history. Also, because it was an in vivo sample, it was not possible to establish a gold standard that represented the absolute reality of the number of root canals present in the MB root. However, the accuracy of CBCT in MB2 investigation has already been demonstrated by recent research (8,24,28,29). The consensus among three duly calibrated examiners with experience in CBCT, two oral radiology specialists, also mitigates these limitations. Other in vivo studies that found the same limitations also used the consensus among two or three examiners to determine the correct number of canals (9,11,13,38,43).

CONCLUSION

The prevalence of periapical lesions in the obturated 1MMs was high; the presence of filling material in the root canal difficults MB2 visualization in CBCT; nonetheless, the homologous evaluation, if possible, can help MB2 investigation.

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CONSIDERAÇÕES FINAIS

O tratamento endodôntico dos 1MSs apresenta dificuldades para os clínicos e até mesmo para os endodontistas, já o retratamento representa um verdadeiro desafio para esses profissionais. Buscar a causa da falha é o primeiro passo para o sucesso. Muitas podem ser essas causas, mas a negligência do canal MP no tratamento inicial parece ser a causa mais frequente para este grupo de dentes.

A TCFC é um instrumento de diagnóstico por imagem valioso na investigação das particularidades anatômicas dos 1MSs, especialmente, na identificação do canal MP. Mas a presença de material obturador, pinos radiculares ou material protético/restaurador nos dentes onde o retratamento é necessário, cria artefatos de imagem que podem dificultar a visualização deste conduto.

Baseado na provável simetria do número de canais na raiz MV dos 1MSs apontada pela literatura e pelos resultados apresentados, este estudo mostrou que a pesquisa em TCFC do molar homólogo pode auxiliar na busca pelo correto diagnóstico. No entanto, mais estudos poderiam elucidar melhor essa questão, buscando respaldo científico para essa possível conduta clínica.

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ANEXO 1

APROVAÇÃO NA COMPESQ

ANEXO 2

TERMO DE CESSÃO DE BANCO DE IMAGENS

Eu, Marcio de Alexandrino, diretor e radiologista do Centro de Diagnóstico por Imagem em Odontologia, concedo o acesso ao banco de imagens de Tomografia Computadorizada de Feixe Cônico realizados nesta clínica no período de 02/04/2012 a 05/06/2015, para fins de pesquisa.

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Porto Alegre, 08 de junho de 2015.