UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL
FACULDADE DE ODONTOLOGIA
PROGRAMA DE PÓS-GRADUAÇÃO EM ODONTOLOGICA
MESTRADO EM CLÍNICA ODONTOLÓGICA - RADIOLOGIA

ESTUDO DA LOCALIZAÇÃO TOPOGRÁFICA DO CANAL MANDIBULAR PELA INCIDÊNCIA LATERAL OBLÍQUA DE MANDIBULA E ANÁLISE DE DISTORÇÕES LINEARES APRESENTADAS PELA TÉCNICA

GAINER RAUL JASA ANDRADE

Porto Alegre
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Dissertação apresentada ao Programa de Pós-Graduação em Odontologia, da Universidade Federal do Rio Grande do Sul, como pré-requisito final para a obtenção do título de Mestre em Clínica Odontológica, Ênfase em Radiologia Odontológica.

Orientadora: Prof. Dra. Heloísa Emília Dias da Silveira
Co-orientador: Prof. Dr. Tabare Ravecca

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RESUMO

Alguns fatores influenciam no dano ao nervo dentário inferior quando da remoção cirúrgica do terceiro molar, sendo a posição do dente e sua íntima relação com o canal mandibular os de maior relevância na avaliação pré-cirúrgica. Assim, se faz importante que o cirurgião tenha o conhecimento prévio da anatomia da região e a precisa localização do canal mandibular, contemplando os dois planos, vertical e horizontal. Este estudo teve como objetivo analisar a localização topográfica vestíbulo-lingual do canal mandibular em relação ao terceiro molar inferior por meio da incidência lateral oblíqua de mandíbula e suas variações, além de mensurar possíveis distorções dessa técnica. Foram selecionadas vinte e quatro mandíbulas secas que continham ao menos um terceiro molar, nestas foram realizadas duas tomadas radiográficas laterais oblíquas de mandíbula, variando a angulagem vertical em 30 graus (0 e -30). Um examinador treinado e calibrado realizou as mensurações em todas as radiografias. As mesmas foram realizadas do teto do canal mandibular até o ponto mais apical do terceiro molar, com paquímetro digital em negatoscópio com máscara. Baseado na análise das duas medições (0 e -30 graus) para cada caso estudado, e levando em consideração a regra do objeto bucal, o examinador estimou o posicionamento do canal mandibular, sendo: lingual, central ou vestibular em relação ao terceiro molar respectivo. Posteriormente, os resultados foram comparados com os achados pela tomografia computadorizada (padrão-ouro). A análise estatística foi realizada por meio dos testes de sensibilidade, especificidade e acurácia. Os resultados mostraram que a técnica lateral oblíqua de mandíbula, associada a sua variação com -30 graus, foi capaz de estabelecer a posição vestíbulo-lingual do canal mandibular em relação ao terceiro molar. Além disso, quantificou-se a magnificação da imagem na técnica lateral oblíqua, considerando-se a mesma aceitável para o propósito do estudo.

Palavras chave: terceiro molar, radiografia dentária, diagnóstico.

ABSTRACT

The aim of this study was to evaluate the use of lateral oblique radiography (LOR) at two different incidence angles for the bucco-lingual topographic localization of the mandibular canal with respect to the lower third molar. A total of 24 dry jaws bearing at least one third molar were subject to LOR at vertical incidence angles of 0° and -30°. A trained and calibrated examiner measured the distance between the mandibular canal top to the most apical point of the third molar, using a digital calliper and individual light box for the radiographs. Based on the analysis of the two measurements (incidence angles of 0° and -30°) and considering the buccal object rule, the observer estimated the location of the mandibular canal, which was classified as lingual, central or buccal to the corresponding third molar. Results were compared with the computer tomography images (gold standard). The statistical analysis included sensitivity, specificity and accuracy tests. These results showed that LOR (0° e -30°) could be used to determine the bucco-lingual location of the mandibular canal with respect to the third molar. Although there is a certain magnification in the LOR images; it was demonstrated that the technique could be used for this study proposal.

Keywords: *third molar, dental radiography, diagnosis*

LISTA DE SIGLAS E ABREVIATURAS

ALARA – As Low As Reasonably Achievable

BOR- buccal object rule

CBCT- cone beam computed tomograph)

CM - canal mandibular

CT - computer tomography

FO-UFRGS - Faculdade de Odontologia da Universidade Federal do Rio Grande do Sul

FO-UdelaR - Facultad de Odontología de la Universidad de la República.

IAN- inferior alveolar nerve

ITM-inferior third mola

Kv – Kilovolts

LOR- obliqua lateral radiograph

MC - mandibular canal

mAs - miliampere segundo

mm - milímetros

mm-millimeters

MOLR-mandibular obliqua lateral radiography

NDI - nervo dentário inferior

RLO - radiografia lateral oblíqua

RLOM - radiografia lateral oblicuade mandíbula

ROB - regra do objeto bucal

TC - tomografia computadorizada

TMI - terceiro molar inferior

TCFC - tomografia computadorizada de feixe cônico

TDVT - técnica de deslocamento vertical do tubo

TRX - tubo de raios x

VTDT - vertical tube displacement technique

XRT- x ray tube

LISTA DE SÍMBOLOS

® marca registrada

< menor

> maior

= igual

p valor de p

SUMÁRIO

1. ANTECEDENTES E JUSTIFICATIVAS

A extração do terceiro molar é um dos procedimentos mais comuns na prática odontológica (SEDAGHATFAR *et al.,* 2005*;* GBOTOLORUN *et al.,* 2007*;* NEUGEBAUER *et al.,* 2008; SUOMALAINEN *et al.,* 2010). A incidência de lesões nervo dentário inferior devido à cirurgia do terceiro molar vai desde 0.2% a 1% para lesões permanentes e de 3.3% a 13% para lesões temporárias (SEDAGHATFAR *et al.,* 2005*;* FRIEDLAND *et al.,* 2007; GBOTOLORUN *et al.,* 2007*;* NEUGEBAUER *et al.,* 2008; KOVISTO *et al.,* 2011*).* A probabilidade de lesionar o feixe vásculo-nervoso situado no interior do canal mandibular aumenta consideravelmente para 30% nos casos em que a raiz do terceiro molar está em contato com o nervo dentário inferior (NEUGEBAUER *et al.,* 2008).

O canal mandibular é uma estrutura anatômica que parte do forame mandibular e desce oblíqua e anteriormente no ângulo, seguindo horizontalmente no corpo da mandíbula até o forame mentual (Figún, M *et a*.,2003*).* Radiograficamente, é observado como duas linhas radiopacas posicionadas paralelas, contornando uma faixa radiolúcida.

Alguns fatores influenciam no dano ao nervo dentário inferior quando da remoção cirúrgica do terceiro molar, sendo a posição do dente e sua íntima relação com o canal mandibular os de maior relevância na avaliação pré-cirúrgica. Assim, se faz importante que o cirurgião tenha o conhecimento prévio da anatomia da região e a precisa localização do canal mandibular, contemplando os dois planos, vertical e horizontal (NAKAGAWA *et al.,* 2007).

Considerando que a posição do canal mandibular varia de um paciente para outro, alguns métodos de imagem são utilizados para sua avaliação, nos quais se destacam: radiografia panorâmica, periapical, lateral obliqua de mandíbula e tomografia computadorizada (WHAITES, 2008).

A radiografia panorâmica é a técnica radiográfica mais utilizada para a análise dos terceiros molares inferiores e a sua relação com o canal mandibular (SEDAGHATFAR *et al.,* 2005; FRIEDLAND *et al.,* 2007; NAKAGAWA *et al.,* 2007; BUNDY *et al.,* 2009). Nesse tipo de investigação, uma série de sinais indicativos de contato entre o canal mandibular e raízes dos molares são avaliados no dimensionamento do risco e dificuldade do procedimento cirúrgico

(TANTANAPORNKUL *et al.*, 2007). Alguns desses sinais incluem: faixas radiolúcidas sobre as raízes; estreitamento das raízes; deflexão das raízes; raízes bífidas; interrupção da cortical do canal mandibular; estreitamento do canal; curvatura acentuada do canal na região dos ápices; superposição ou contato do canal e raízes. Apesar dos sinais radiográficos sugerirem uma proximidade entre o canal mandibular e as raízes, se compreende que a radiografia panorâmica gera uma imagem bidimensional, propiciando, muitas vezes, informações limitadas (KOSITBOWORNCHAI *et al.* 2010*;* DELAMAR*E et al.,* 2012*).*

Entre as técnicas intrabucais, a periapical é usualmente o método mais utilizado para o estudo pré-operatório na remoção dos terceiros molares inferiores (WHAITES, 2008; KOSITBOWORNCHAI *et al.,* 2010). Com esta incidência é possível a realização da técnica de deslocamento vertical do tubo, otimizando a informação bidimensional que ela oferece (KOSITBOWORNCHAI *et al.,* 2010*).* No entanto, esta pode tornar-se inconveniente ao paciente por apresentar desconforto durante a sua realização (SUSARLA *et al.,* 2007).

A radiografia lateral oblíqua de mandíbula (RLOM) é uma técnica radiográfica extrabucal que consiste na projeção do corpo e ramo mandibular, podendo ser obtida com o uso de equipamentos de raios X odontológico. Anteriormente ao desenvolvimento dos equipamentos panorâmicos, esta era a técnica habitualmente utilizada em hospitais e na prática geral (GOVIANDRAO, 2008). Sendo a RLOM indicada para o estudo dos terceiros molares impactados, fraturas e lesões que se estendam ao ramo mandibular, se faz necessário observar as vantagens da técnica, dentre elas o baixo custo do exame, a menor quantidade de radiação ao que o paciente é exposto e a ausência de desconforto. Ainda, existe a possibilidade de poder ser realizada no consultório odontológico, excluindo a necessidade de deslocamento até centros especializados.

Utilizando a regra do objeto bucal e mediante a técnica do deslocamento vertical de tubo, é possível obter a localização vestíbulo-lingual do canal mandibular com respeito ao terceiro molar inferior, com duas incidências laterais oblíquas, aprimorando desta forma, a imagem bidimensional que as radiografias oferecem. Define-se a regra do objeto bucal, como o deslocamento aparente de um objeto devido a diferentes posições/visualizações do

observador. Para isso, duas radiografias são feitas com uma variação da angulagem vertical entre a primeira e segunda (técnica do deslocamento vertical de tubo). Nas imagens radiográficas resultantes será possível observar que a posição do objeto em relação à referência utilizada modifica, podendo-se então localizar o mesmo tridimensionalmente.

Eric Whaites (2008) descreve os métodos, um no plano horizontal e outro em um plano vertical. No plano horizontal, a técnica de Clark é a mais usada; no plano vertical, a técnica foi realizada primeiramente por Richard em 1952 (GOVIANDRAO, 2008), sendo chamada por Kositbowornchai (2010) de técnica do deslocamento vertical do tubo de raios X. Este autor buscou identificar a relação do canal mandibular e do terceiro molar, combinando radiografias panorâmicas com periapicais. Toda a imagem radiográfica possui distorção de tamanho devido a trajetória divergente dos fótons de raios X e o deslocamento vertical do tubo de raios X produz uma maior magnificação na imagem resultante. Esta magnificação agregada deve ser aceitável e entendida pelo cirurgião, já que poderia influir no planejamento cirúrgico. (ARDAKANI E *et al., 2011)*

A literatura mostra que alguns autores preferem utilizar técnicas distintas para poder observar a relação do canal mandibular com o terceiro molar inferior, nos três planos espaciais. Neugebauer (2008) em seu estudo recorre à panorâmica combinada com a técnica cefalométrica pósteroanterior de boca aberta com 15 graus de inclinação do feixe de raios X.

Outro método de imagem usado para a localização do canal dentário inferior e sua relação com terceiros molares é a tomografia. A tomografia convencional é uma técnica realizada com filmes radiográficos que permite a visualização dos três planos (NAKAGAWA *et al.,* 2007*)*, porém as imagens resultantes são de difícil interpretação, visto que as mesmas apresentam-se borradas (FRIEDLAND *et al.,* 2008; SUOMALAINEN *et al.,* 2010).

A tomografia computadorizada vem sendo bastante utilizada para definir a localização do canal mandibular (FRIEDLAND *et al.,* 2008). Por meio dessa técnica obtêm-se imagens nos planos frontal, lateral e axial, com tamanho real e sem sobreposições (ROTHMAN, 1998; MENGEL *et al.,* 2005, 2006*)*. Com o desenvolvimento da tomografia computadorizada de feixe cônico pode-se

reduzir custos e também a dose de exposição do paciente, quando comparada com a tomografia computadorizada de feixe em leque (TANTANAPORNKUL *et al.*,2007). Além disso foram otimizadas as condições de visualização e manipulação das imagens (MOZZO *et al.,* 1998; HOLBERG *et al.,* 2005; SCARFE *et al.,* 2006).

O uso de tomografias computadorizadas apresentam algumas desvantagens como por exemplo: sua alta dose de radiação em comparação com os estudos convencionais radiográficos; o alto custo do equipamento e dos exames, o que limita o acesso por parte dos pacientes (SUSARLA *et al.,* 2007; TANTANAPORNKUL *et al.,* 2007; NAKAMORI *et at.,* 2008; JHAMB *et al.,* 2009*;* KOSITBOWORNACHAI *et al.,* 2010). Outra desvantagem desta modalidade ocorre quando a região do terceiro molar possui uma grande quantidade de osso medular, tornando difícil o diagnóstico entre o canal mandibular e o espaço medular (SUSARLA *et al.,* 2007).

Tendo em vista o que foi exposto, torna-se fundamental buscar o máximo de informações a partir dos exames por imagem, expondo o paciente a menor dose radiação possível, levando-se em consideração o princípio ALARA. Assim, este estudo buscou avaliar a localização vestíbulo-lingual do canal mandibular em relação ao terceiro molar por meio da técnica lateral oblíqua de mandíbula e suas variações (0° e -30°), além de analisar as distorções de imagem desta técnica por meio de medidas lineares dentais e ósseas, utilizando-se como padrão-ouro imagens tomográficas.

2. OBJETIVOS

2.1 Geral

Avaliar a localização vestíbulo-lingual do canal mandibular em relação aos terceiros molares inferiores, utilizando duas tomadas laterais oblíquas de mandíbula com 0 e -30 graus, além de determinar a distorção linear apresentada pelas imagens.

2.2 Específicos

1. Avaliar por meio de duas tomadas laterais oblíquas com angulagens de 0 e -30 graus, a localização radiográfica do canal mandibular em relação aos terceiros molares inferiores no sentido vestíbulo-lingual, confirmando com o padrão-ouro (imagens tomográficas).
2. Determinar a distorção linear que apresenta a técnica lateral obliqua e sua variação.

3. ARTICLE

HOW TO DETERMINATE THE BUCCAL LINGUAL LOCALIZATION OF THE MANDIBULAR CANAL IN RELATIONSHIP WITH THE THIRD MOLAR USING THE LATERAL OBLIQUE TECHNIQUE

ABSTRACT

The aim of this study was to evaluate the use of lateral oblique radiography (LOR) at two different incidence angles for the bucco-lingual topographic localization of the mandibular canal with respect to the lower third molars. A total of 24 dry jaws bearing at least one third molar were subject to LOR at vertical incidence angles of 0° and -30°. A trained and calibrated examiner measured the distance between the mandibular canal top to the most apical point of the third molar, using a digital calliper and individual light box for the radiographs. Based on the analysis of the two measurements (incidence angles of 0° and -30°) and considering the buccal object rule, the observer estimated the location of the mandibular canal, which was classified as lingual, central or buccal to the corresponding third molar. Results were compared with the computerized tomography images (gold standard). The statistical analysis included sensitivity, specificity and accuracy tests. These results showed that LOR (0° e -30°) could be used to determine the bucco-lingual location of the mandibular canal with respect to the third molar. In spite of the magnification, the LOR images demonstrated that the technique could be used for this study proposal.

INTRODUCTION

Surgical removal of lower third molar is a common procedure in clinical dental practice [1-4] and could be associated with post-operative complications related to inferior alveolar nerve injuries. The permanent nerve injury amounts between 0.2% and 1% of surgeries, while the temporary injury is between 3.3% and 13%[1,3-6], and increases on around 30% when the third molar root is in direct contact with the inferior dental nerve[1]. Consequently, a specific evaluation of the mandibular canal and the proximate molars is essential during pre-operatory planning.

Considering the different positions of the lower third molar (LTM), and because it's relative position in respect of the mandibular canal (MC) differs according to the patient, several imaging methods could be used for the diagnosis. The panoramic radiograph is usually used as a radiographic method of examination for treatment planning of third molar removal, due to its wide availability, low cost and relatively low exposure dose [5,7,8,15,23]. The periapical technique could be used for pre-surgical evaluation of lower third molars [9,11], however the film position could be uncomfortable and compromises the diagnosis [10]. It should be observed that the bucco-lingual aspect couldn't be visualized by the panoramic and periapical techniques. A limitation associated with these techniques is that they provide a two-dimensional image [9].

Cross-sectional or conventional computed tomography was used in the dental practice before the introduction of cone beam computed tomography (CBCT) [5]. Due to the recent development of CBCT, three-dimensional images are becoming more easily available in dentistry, allowing extra investigation of MC and surrounding molars[22]. This technique provides non-superimposed full-size images on the three spatial planes [19,25,26,30]. Some disadvantages of CBCT is related to the high radiation dose compared with the conventional radiography, the high cost of equipment and the limited accessibility [9,10,12,13].

Lateral oblique radiography (LOR), is an extra-oral technique referred to as lateral oblique mandibular view. In some situations LOR is the favoured technique in view of the low cost and the low patient radiation dose.

The LOR radiographs and the others techniques show some distortion in consequence of the divergent trajectory of X-ray photons [30]. As a result, the

surgeon must be well acquainted with this magnifying effect. It should be noted that the dimensional reliability of pre-surgical radiographic tests has been reported to be the primary determinant of the post-surgery success of the overall dental procedure [29].

In view of the necessity to establish the dental position and its relation with mandibular canal, some authors, based on the ALARA principle, recommended the use of radiographic localization methods [16,17,18]. Thus, this study aimed to evaluate a LOR, based on the vertical tube displacement technique (VTDT) using two different incidence angles to determine the position of the mandibular canal and lower third molar. Moreover, evaluate the linear measures distortions, using CT images as the golden standard.

MATERIALS AND METHODS

This cross-sectional study was conducted with a total of 24 jaws and 37 third molars selected from the Anatomy Museum of UdelaR School of Dentistry. This research was approved by the Ethics Committee of UdelaR's School of Dentistry.

Two lateral oblique radiographs were obtained of each third molar with a changed vertical angle (0º and -30º, respectively) (Figure 1). The X-ray beam was directed to the retro mandibular space [20] located at the intersection of the posterior margin of the mandibular ramus and a horizontal line extended posteriorly from the basal mandibular bone [11]. The jaws were placed in a standard device and the image receptor in parallel position and direct contact with the ramus and mandibular body under study (Figure 2). LOR's were acquired on a Kodak 2200 intra-oral system (exposure values of 70Kv, 7mA and 0.01s). An 18x24cm Kodak radiographic film was used. The exposed film was manually processed. Axial tomograms (SOMATOM Siemens AG Medical Solutions, Erlangen, Germany, 64-channel, 120Kv and 90mA) were obtained of each of the jaws in a standard position, with a slide distance of 0.5mm. These images accounted the gold standard. The examiner had a calibration run up.

Radiographic and tomographic evaluation

A trained and calibrated examiner (Kappa >0.8) made the measures, two times with an interval of 15 days. The 0º LOR was firstly evaluated followed by -30º, measuring the distance from the most apical point of the third molar to the most superior point of the mandibular canal. The evaluations were made on a light box using a digital caliper. Based on the radiographic localization method, the relationship between the mandibular canal and the third lower molar was classified as lingual, central or buccal position, established by the value found: decrease, unchanged or increase. The minimum unit considered was 0.2mm, based on the resolution capacity of the human eye [24]. The analyses were repeated with a 15-day time interval.

Osirix free software (Geneva, Switzerland) was used to evaluate three-dimensional analysis and establish the gold standard. The coronal was considered the most appropriate plane to analyse the images for determinate the mandibular canal position [14].

To establish the linear measures distortion, marks were made on the radiographs and tomograms, showing the crown equator and the crown-radicular length of third molars (tooth length). The distance between the distal alveolar crest of the third molar, determined vertically until the mandibular basis and horizontally until to the posterior margin of the mandibular ramus (Figure 3). If the distal crest of the third molar could not be considered because to intra-osseous insertion, the distal alveolar crest of the lower second molar was used. Four linear measures were made on each image, totalling 12 measurements. It were made on all radiographs with a digital caliper on a light box. The gold standard was defined by the tomograms using Osirix software tools.

Statistical analysis

R Software (version 2.15.3) was used to run statistical analysis. Sensitivity, specificity, positive predictive values, negative predictive values and accuracy values were calculated based on gold standard. The intra-observer reliability was assessed by kappa values.

Radiographic distortion was evaluated using the paired t-Student test, with $p \geq 0.05$; $p < 0.05$(*); and $p < 0.01$(**).

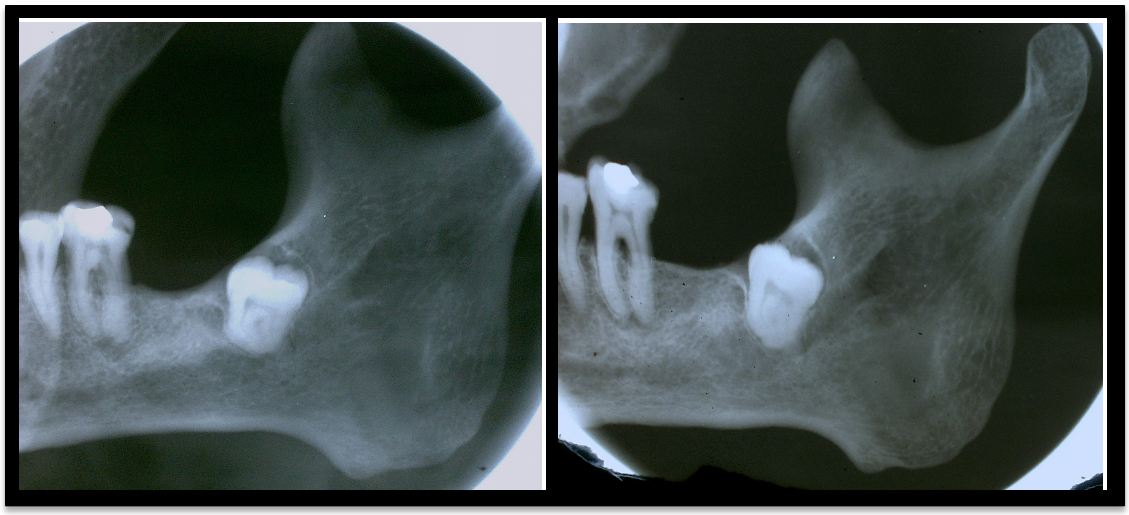

Figure 1: Two lateral oblique radiographs obtained of each third molar with a changed vertical angle (0º and -30º, respectively).

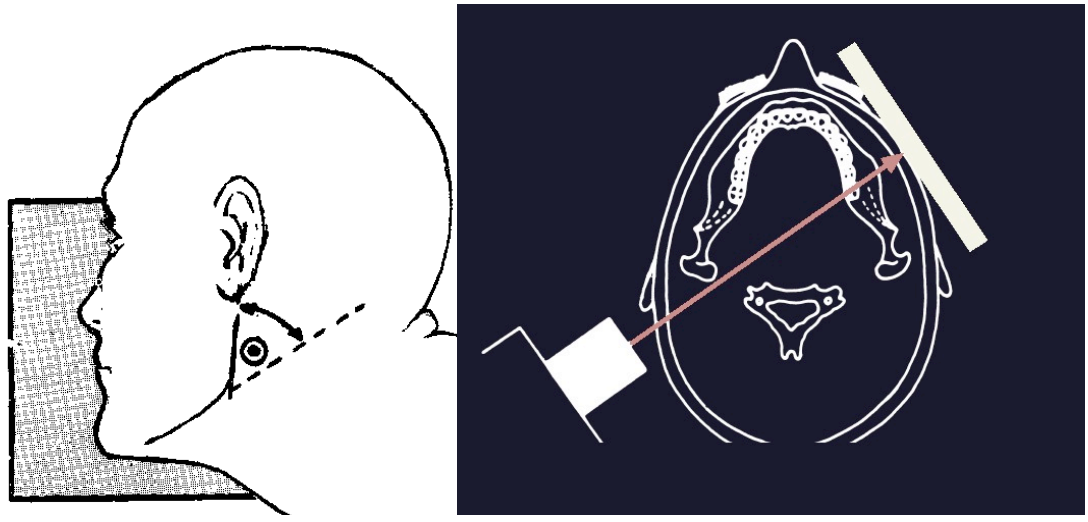

Figure 2: Lateral oblique radiographs technique.

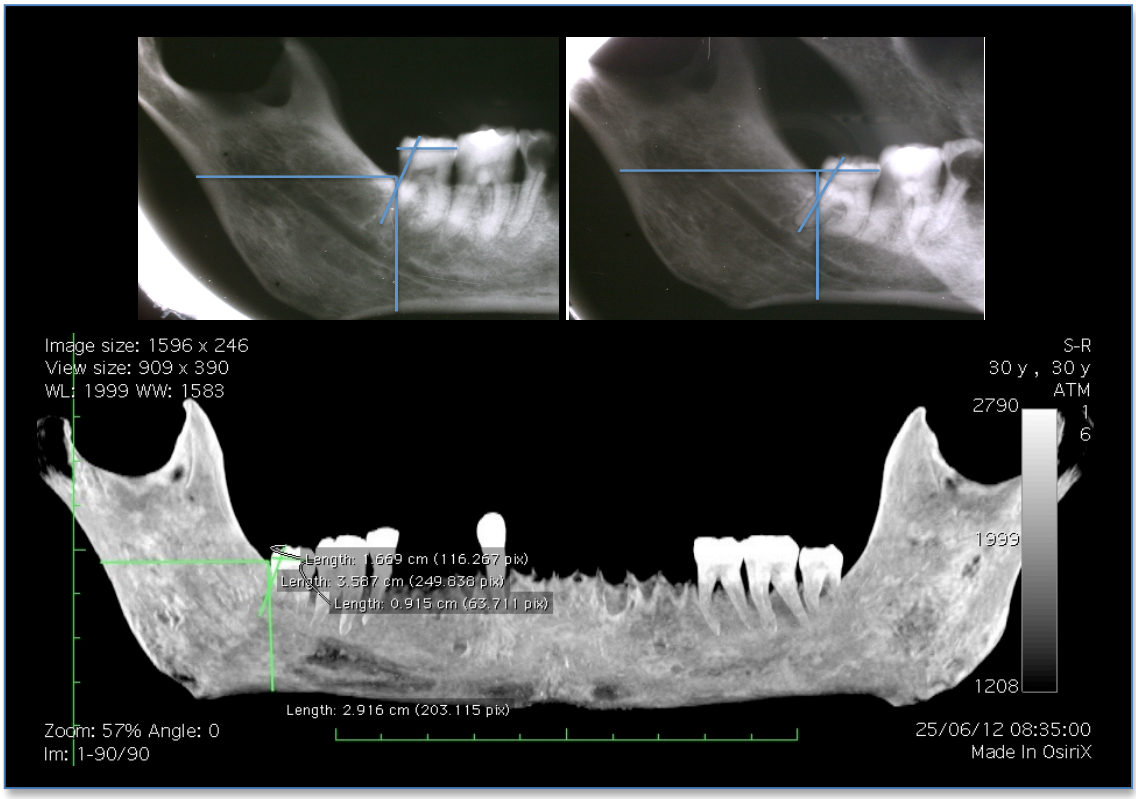

Figure 3: The lateral oblique radiographs and tomogram, showing the crown equator and the crown-radicular length of third molars (tooth length). And distance between distal alveolar crest of the third molar until mandibular base (vertical) and until posterior margin of the mandibular ramus (horizontal).

RESULTS

Two of the 37 third molars were not evaluated because the incapability to observe the mandibular canal. Table 1 shows the distribution of the mandibular canal location, determined by the tomographic images (gold standard).

Table 2 shows the position of the mandibular canal defined by LOR with two incidence angles and compared with those obtained by tomographic images. Tables 3 and 4 shows sensitivity and specificity, positive and negative predictive values and accuracy for the two LOR evaluations. The accuracy of intra-observer agreement was between 0.943 and 0.971. A high degree of intra-observer agreement was found between the first and second evaluations, with kappa = 0.832.

Sensitivity and specificity, as well as positive and negative predictive values of intra-observer agreement are shown in Table 5. As shown in Table 6, a comparison of the -30° and 0º LOR shows a higher distortion in vertical measurements. Considering that measurements of tooth length and body are vertical and that those of crown and ramus are horizontal, a higher degree of distortion by magnification was observed in vertical measurements, as shown in Table 7.

Table 1. Distribution of the position of the mandibular canal related to the third lower molar (n=35).

Tomographic images	Central	Lingual	Buccal	Total
1st evaluation	9 (25.7%)	3 (8.6 %)	23 (65.7 %)	35 (100%)
2nd evaluation	9 (25.7%)	3 (8.6%)	23 (65.7 %)	35 (100%)

Table 2. Position of the mandibular canal detected in the first and in the second radiographic evaluation, respectively.

	Tomographic images		
Radiograph evaluation	Central	Lingual	Buccal
Central	8 - 9	0 - 0	0 - 2
Lingual	0 - 0	3 - 3	0 - 0
Buccal	1 - 0	0 - 0	23 - 21

Table 3. Sensitivity, specificity (in parentheses) and accuracy for the third lower molar localization in the first and second RLO evaluation.

Evaluation	Central	Lingual	Buccal	Accuracy
First	0.889 (1.000)	1.000 (1.000)	1.000 (0.917)	0.971
Second	1.000 (0.923)	1.000 (1.000)	0.913 (1.000)	0.943

Table 4. Positive and negative (in parentheses) predictive values for the third lower molar localization in the first and in the second RLO evaluation.

Evaluation	Central	Lingual	Buccal
First	1.000 (0.963)	1.000 (1.000)	0.958 (1.000)
Second	0.818 (1.000)	1.000 (1.000)	1.000 (0.857)

Table 5. Sensitivity, specificity, positive and negative predictive values of intra-observer agreement

	Central	Lingual	Buccal
Sensitivity	0.727	1.000	1.000
Specificity	1.000	1.000	0.786
Pos. Pred. Value	1.000	1.000	0.875
Neg. Pred. Value	0.889	1.000	1.000

Table 6. Distortion (percentage) for the two lateral oblique radiographs (-30° and 0º).

Measurement		Difference/cm (p-value)	RX distortion
Tooth	LOR (0) vs. LOR (-30)	-0,189(p<0.0001)	8.728%
Crown	LOR (0) vs. LOR (-30)	-0.016(p=0.0416)	1.288%
Body	LOR (0) vs. LOR (-30)	-0,397(p<0.0001)	13.41%
Ramus	LOR (0) vs. LOR (-30)	-0.019(p=0.3366)	0.4313%

Table 7. Distortion of the measurements made on the lateral oblique radiographs in comparison with computed tomography (CT) results.

Measurement	Difference cm/(p-value)	Distortion
Tooth length: CT vs. LOR (0)	-0.26(p=5.385e-11**)	15.46%
Tooth length: CT vs. LOR (-30)	-0.45 (p=2.2e-16**)	26.50%
Crown: CT vs. LOR (0)	-0.11 (p=3.306e-05**)	10.05%
Crown: CT vs. LOR (-30)	-0.13 (p=1.943e-06**)	11.48%
Body: CT vs. LOR (0)	-0.16 (p=1.103e-06**)	6.87%
Body: CT vs. LOR (-30)	-0.56 (p=8.5e-16**)	23.40%
Ramus: CT vs. LOR (0)	-0.38 (p=9.573e-10**)	9.56%
Ramus: CT vs. LOR (-30)	-0.4 (p=9.984e-10**)	10.03%

(**) $p < 0.01$

DISCUSSION

Third molar extraction is the surgical procedure most frequently conducted by dentists and dental surgeons. An imaging exam is indicated prior to surgery to assess the relation of the LTM with the MC, aiming to avoid any damage to the inferior alveolar nerve [1,2,3,4]. The panoramic radiography is the chosen exam [3,5,7,8,15,21], followed by intra-oral periapical radiography [9,11]. Although those exams allow an evaluation of tooth position and an estimation of its proximity to the MC, a bucco-lingual appreciation of the MC and the identification of direct contact between structures are not possible.

In this situation, some authors [1,12,35] recommended the use of CBCT for a deep assessment of the relation between ITM and the MC. In spite of the reduced radiation dose when compared to the fan beam CT [36-37], its radiation is higher than a radiographic exam [38]. Besides, the availability of CBCT units is still limited. Therefore, this study aimed to test a low radiation exam available for a population that do not have access to panoramic or CBCT units. Also, a variation in the LOR technique allowed an evaluation of the bucco-lingual position of the MC.

No previous studies have reported on the use of the parallax principle on the vertical plane for establishing the bucco-lingual relationship of the MC with respect to the LTM. The results from this study demonstrated that the LOR proposed technique is highly effective to classify the MC as lingual, central or buccal in relation to the LTM. Ghaeminia *et al.*[34] have observed that lingual positioning of the MC is significantly linked with injuries to the IAN, showing the importance of this assessment before surgery.

Kositbowornchai *et al.*[9] suggested the use of CBCT if a panoramic radiograph combined with periapical technique with vertical tube shift method does not provide sufficient information, or when it is not possible to conduct an intra-oral exam. According to the results from this study, the LOR does not cause patient discomfort, and may be considered prior to the CBCT indication.

One disadvantage of the use of LOR, compared with CBCT, is associated with image distortion or magnification, since CBCT provides non-superimposed real-size images on the three spatial planes [12,21,25,26,30]. However, compared with panoramic radiography — reported magnification values

between 20% and 30% for the posterior mandible region [27,28,32,33] — the distortion values found in this study — in order of 15% and 26.5% when an angulation of 0º and -30º were used, respectively — suggest that LOR can be used successfully, with LOR at 0° resulting in a smaller degree of distortion than panoramic radiography.

Because the distance between the MC and the ITM is small, and occasionally both are superimposed, it is necessary to change the vertical angle to a minimum of -30º in the second acquisition in order to observe the apparent

movement of the MC in the radiographic image. However, LOR at -30° resulted in appreciable distortion, amounting to up to 26.5% of the tooth length. Thus, those images should be interpreted with extreme care based on understanding of the particular image acquisition principles.

The results of this study allowed the assessment of the ITM with a low cost and, more important, low radiation dose technique. Therefore, LOR at incidence angles of 0° and -30° may be successfully used to determine the bucco-lingual relationship between the mandibular canal and the lower third molar.

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CONSIDERAÇÕES FINAIS

A preocupação em estabelecer a relação entre o terceiro molar e o canal mandibular, previamente a extração, está evidenciada pelo elevado número de artigos publicados que se ocupam deste tema.

Embora com o advento da tomografia computadorizada de feixe cônico a investigação desta relação tenha se tornado possível e facilitada pela evidenciação das estruturas envolvidas nos planos coronal, sagital e axial, esta tecnologia não está disponível para toda a população. Assim, procurou-se neste estudo encontrar alternativas mais acessíveis ao público, de fácil execução e envolvendo menor exposição do paciente à radiação X, conforme exigido pelo principio ALARA.

Neste contexto foi idealizada a investigação com a técnica lateral oblíqua de mandíbula que se mostrou eficaz e propicia fácil acessibilidade, baixa exposição à radiação e está ao alcance da população.

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ANEXOS

Anexo 1

Autorização para uso das mandíbulas na pesquiza.

Universidad de la República

Facultad de Odontología

Cátedra de Anatomía General y Buco Dental

Dirección: Gral. Las Heras 1925 – Tel.: 487 30 48 int. 148 – e mail: anatgral@odon.edu.uy

Montevideo, 11 de abril de 2011

Por la presente dejo constancia que las piezas anatómicas que se emplearán en el proyecto "Estudio de la localización topográfica del canal mandibular en relación al tercer molar inferior por la incidencia Lateral Oblicua de la Mandíbula y sus variaciones." pertenece a la colección de esta cátedra. Siendo éstas, veinticinco huesos mandibulares.

Prof. Dr. Jorge Gutiérrez

Profesor Titular

Universidad de la República
Facultad de Odontología

ESCUELA DE GRADUADOS

Montevideo, 25 de Abril de 2011.

DIRECTOR DEL HOSPITAL DE CLÍNICAS
PROF. DR. VÍCTOR TONTO

Por la presente, la Facultad de Odontología, UdelaR informa la necesidad de contar con un estudio por medio de Tomografía Computada en la Institución que usted dirige.

En el marco de un convenio efectuado entre la Facultad de Odontología de la Universidad Federal de Rio Grande do Sul, con la Facultad de Odontología, UdelaR, el Dr. Jasa se encuentra realizando una Maestría en Odontología focalizada en Radiología.

Para continuar con su avance curricular se requiere que efectúe, a modo de antecedente y fundamentación de su tesis, un único estudio por medio de Tomografía Computada de piezas anatómicas a saber, mandíbula.

Agradeciendo su tiempo y sin otro particular saluda atentamente;

Prof. Agdo. Dr. Tabaré Ravecca
Director de la Escuela de Graduados
Facultad de Odontología (UdelaR)

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