Original Article

Questionnaire survey on methods of determining the relationship of the mandibular canal and third molars

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Abstract

Background: Clinicians should assess and monitor mandibular canal (MC) to achieve an uneventful and successful final result. Two dimensional techniques like panoramic radiography, intra oral periapical radiographs are commonly used for assessment of MC, along with three dimensional techniques like cone beam computed tomography (CBCT).

Objectives: To assess the radiologic modalities and assessment criteria used by clinically practicing dental surgeons when determining the proximity of MC to third molars.

Method: A questionnaire based study was carried out among national and international oral maxillofacial surgeons and general dental practitioners. Data were fed to SPSS software version 21 for descriptive statistics.

Result: Most of the participants (54.7%) in the study preferred combination of panoramic radiograph and CBCT for determining the relationship of mandibular canal and third molars measures.

Conclusion: Initial screening can be carried out using panoramic radiograph which is a popular method in determining the relation between the third molar and mandibular canal in spite of some limitations. Cone Beam Computed Tomography is an important three-dimensional imaging technique which is a preferred method amongst most dental surgeons.

Key Words: Mandibular canal, Third molar, Imaging modality

Introduction

Mandibular canal is a vital structure which passes inferior to the roots of the posterior teeth.[1] Third molar extraction is one of the most common surgeries in oral and maxillofacial procedures. The most common complication associated with this surgery is injury to the mandibular canal.[1] A number of radiographic modalities are available to

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evaluate the proximity of the apices of third molar to mandibular canal (MC).[2] Various types of imaging modalities are available for assessment of proximity of mandibular third molars to mandibular canal. Some of the common modalities are panoramic, peri-apical and lateral oblique radiographs. Panoramic radiography is the standard two dimensional diagnostic tool for assessment of the positional relationship between the mandibular third molar and MC.[3] Previous studies have assumed that most clinicians use panoramic radiographs with a series of radiologic criteria as an indicator of the relationship and the risk of postoperative complications like dysaesthesia.[1] Common nine criteria used for assessment of the relationship between the inferior alveolar nerve and the lower third molars include increased radiolucency of the root(s) of the mandibular third molar, loss of mandibular border, change in mandibular canal direction, mandibular canal narrowing, root narrowing, root deviation, bifid apex, superimposed root and radiolucent band.[2,4] The inferior alveolar nerve can be damaged as a result of direct or indirect forces to the mandibular canal which is one of the most serious postoperative complications.[5,6,7,8] Clinicians use various radiographic markers to indicate such relationships. If the radiological markers of the panoramic radiograph indicate a close proximity, additional investigations may be recommended to verify the relationship in a three dimensional view like Computed Tomography (CT) scan and Cone Beam Computed Tomography (CBCT). CBCT has been introduced to overcome the drawbacks of conventional CT as it reduces the radiation dose delivered to patients.[8,9] The objectives of this study were to assess the radiologic modalities and assessment criteria used by clinically practicing dental surgeons when determining the proximity of MC to third molars.

Materials and Methods

Ethical clearance was taken from Nepal Medical College- Institutional Research/ Ethical Review committee (NMC-RERC) before starting the study. The questionnaire study was initiated only after validation of the questionnaire for reliability and the study was carried out between November 15, 2015 to July 15, 2016. The questionnaire was in English and was designed to assess the radiologic modalities and assessment criteria used by clinically practicing dental surgeons when determining the proximity of MC to third molars. Convenient sampling was taken for sample size determination. Informed verbal consent was taken from each participant before administration of the questionnaire. Clinically practicing Nepalese dentists (BDS/ MDS), currently practicing in teaching dental institutions with minimum of 1 year experience were included.

International dentists who participated in a conference organized in Kathmandu were

also included in the study. Questionnaires were also mailed to some international oral maxillofacial surgeons. Exclusion criteria included dentists who did not give consent to participate. Dental specialists other than oral maxillofacial surgeons were not target populations as they did not carry out extraction procedures routinely. Willing participants were informed in detail by the investigators about the research project through face-to-face interviews, telephonic conversations and email correspondence. Privacy of the dentists was ensured during filling of questionnaires.

A series of questions determining the types of imaging modalities, combinations used, the number of cases investigated over the previous 1 year and whether the modalities provided relevant information in determining the relationship between the MC and the roots of third molars were asked. The nine radiologic criteria commonly used for assessment of the relationship between the mandibular canal and the lower third molars were used. Furthermore, the participants were asked to record the preferred radiologic criteria for diagnosing the MC/ third molar relationship in each panoramic image.

The questionnaire was subjected to statistical analysis. Data were fed to SPSS software version 21.0 and were analyzed statistically using descriptive analysis and Chi-square test, $p < 0.05$ was considered to be significant with a confidence interval of 95%.

Results

The total sample size was 150, out of which 100 were Nepalese dentist and 50 were international dentists. Of the 100 Nepalese dentists, 45 were oral maxillofacial surgeons with the rest being general practitioners (Table 1). Most of the participants (54.7%) in the study preferred combination of panoramic radiograph and CBCT for determining the relationship of mandibular canal and third molars (Table 2 and 3). Around 61% of participants advised more than 100 radiographic investigations over that last 12 months and most of them advised panoramic radiographs (38%) followed by CBCT (Graph 1 and 2). Around 45% of the participants considered all the nine radiologic criteria important for determining the relationship between mandibular canal and third molars (Graph 3). Change in mandibular direction (70.7%), root deviation (84.7%) were some of the radiologic criteria they used to indicate close relation of the mandibular canal/ third molar relationship in each panoramic image (Table 4). Around 47% of the participants considered all the nine radiologic criteria important for advising CBCT for determining the relationship between mandibular canal and third molars (Graph 4). Most of the participants felt mandibular canal narrowing (92%), root deviation (90.7%) and change in mandibular canal direction (79.3%) as the important radiologic criteria that indicated the need for CT/ CBCT (Table 4). There was

a significant statistical difference in the modality preferred in determining relation between mandibular canal and third molar by national and International dental surgeons (Table 5). Significant difference was also seen in the modality advised in determining relation between mandibular canal and third molar by national and International dental surgeons (Table 6).

Table 1: Nationality Gender and specialist distribution of dental surgeons

Participants	Male	Female	Oral and maxillofacial surgeons	General Practitioners	Total Participants
Nepali	70	30	45	55	100
International	30	20	39	11	50

Table 2: Modality preferred in determining relation between mandibular canal and third molar (n= 150)

Imaging Modality	Frequency	Percentage
Panoramic	34	22.7
Peri-apical	15	10.0
CT/ CBCT	19	12.7
Combination (Panoramic and CBCT)	82	54.7

Table 3: Combinations preferred (n= 150)

Imaging modality	Frequency	Percentage
Periapical and Panoramic	18	5.3
Periapical and CT/ CBCT	15	12.0
Panoramic and CT/ CBCT	109	72.7

Table 4: Radiologic Criteria used to indicate close relation of the mandibular canal/ third molar relationship in each panoramic radiograph (n= 150) and radiologic criteria that indicates the need of CBCT (n= 150)

Radiologic Criteria	Indicates close relation of the mandibular canal/ Third molar relationship in each panoramic radiograph (n= 150)		Indicates the need of CBCT (n= 150)	
	Frequency	Percentage	Frequency	Percentage
Radiolucent Band	50	33.3	26	17.3
Loss of mandibular border	77	51.3	42	28.0
Contact mandibular canal	77	51.3	119	79.3
Mandibular canal narrowing	97	64.7	138	92.0
Root narrowing	40	26.7	98	65.3
Root deviation	127	84.7	136	90.7
Bifid apex	123	82.0	43	28.7
Superimposition	77	51.3	96	64.0
Change in mandibular canal direction	106	70.7	54	36.0

Table 5: Modality preferred in determining relation between mandibular canal and third molar by national and International dental surgeons (n= 150)

Participants	Panoramic	Periapical	CBCT	Panoramic and CBCT	Total	p- value
Nepali	15	12	14	59	100	0.002*
International	12	5	10	23	50	

*Statistically significant at p< 0.005

Table 6: Modality advised in determining relation between mandibular canal and third molar by national and International dental surgeons over the previous 12 months (n= 150)

Participants	Panoramic	Peri-apical	Lateral oblique	CBCT	CT	p-value
Nepali	49	31	0	19	1	0.000
International	13	3	2	32	4	

*Statistically significant at p< 0.005

Discussion

Radiographs in dentistry help in a proper diagnosis, correct treatment planning, and are an important tool in intra-operative procedures and outcome assessments.[10] The knowledge of the precise relationship between the inferior alveolar nerve and the roots of the mandibular third molar is crucial in allowing the appropriate planning of the procedure.[8] This study revealed that all surgeons used panoramic radiograph as it was easily available and useful for initial screening purposes and planning of the surgical procedure which was consistent with the study done by boot et al.[2] Though most surgeons used panoramic radiograph, only few considered it sufficiently accurate in determining the relationship between the mandibular canal (MC) and the third molar root .The fact that most surgeons preferred using a combination of panoramic and CBCT as seen in this study justifies the advantages of three-dimensional radiograph as seen in this study. The surgeons used a varying extent of radiologic criteria on a panoramic radiograph with most of the surgeons using root deviation and change in mandibular canal to determine the relationship. A further review of research of this relationship in a study carried out by Rood et al (1990) revealed presence of a significant anatomical variation in mandibular canal.[5] Around 45% of the participants considered all the nine radiologic criteria important for determining the relationship between mandibular canal

and third molars which was consistent with a study carried out by Koong et al (2006).[2] Because of this high variation in MC/ third molar relationship, a detailed pre-operative radiographic assessment was suggested to identify both the position (buccal, lingual or inferior) and approximation of MC to third molar to minimize the risk of postoperative dysaesthesia.[5,6,7,8] The need for three-dimensional imaging is increasing in dentistry. CBCT has been a promising tool in all countries, including a developing country like Nepal.[11] Apart from indications like localization of impacted tooth, visualization of oral and maxillofacial pathologic entities, TMJ related problems, craniofacial fractures, endodontics, periodontal assessments and Oral implantology, CBCT has added benefit of accurate visualization of mandibular canal and also detecting anatomical abberrations.[11,12] CBCT has been introduced in an effort to overcome the shortcomings of the conventional CT as well like higher radiation dose, lower spatial resolution and the higher costs. In addition, with the use of three-dimensional-image-based planning software, the course of the mandibular canal can also be marked at different locations depicting anatomical variations more clearly and thus minimizing damage to MC.[13]

Conclusion:

For third molar assessment, initial screening can be carried out using panoramic radiograph, which is a popular method in determining the relation between the third molar and mandibular canal in spite of some limitations. Since CBCT provides a reliable insight in the three-dimensional relationship of the mandibular third molar root with the mandibular canal for optimal surgical procedure to remove third molar teeth, CBCT alone ora combination of CBCT and panoramic can be advised for evaluating third molar and MC relationship. However; availability, cost and radiation exposure issues should be taken into consideration. Literature review reveals no researches in Nepal on methods of determining the relationship of the mandibular canal and third molars and we believe this may be of value to dental practitioners when assessing mandibular third molars for surgical treatment. The limitation of this study was that all dentists could not be included in this study and therefore, we recommend similar study to be carried out in future including more number of dentists and including other specialists too other than only oral and maxillofacial surgeons.

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