Relative position of mandibular third molar and inferior alveolar nerve using cone beam computed tomography

Sobia Salam[1], Arbab Zia ur Rehman[2], Shiraz Alam[2], Yusra Jamil[1], Muhammad Irshad[3]

ABSTRACT

Objective: To evaluate the relative position of mandibular third molar with inferior alveolar nerve using cone beam computed tomography.
Study Design: Descriptive Cross-sectional study.
Place and Duration: Department of Oral Biology, Rehman College of Dentistry, Peshawar from 1st December 2016 to 30th April 2019.
Methodology: Cone beam computed tomography scans of 140 patients were evaluated and relative position of inferior alveolar nerve and mandibular 3rd molar was categorized into Buccal, Lingual, inferior and inter radicular positions. Direct contact or no contact was documented between mandibular third molars and inferior alveolar nerve and type of contact was stratified on nerve positions.
Results: Among 47.1% of cone beam computerized scans, Inferior alveolar nerve was present buccal to the mandibular 3rd molar with 27% having direct contact. 17.1% scans had Inferior alveolar nerve present lingual to the mandibular third molar with 41.6% having direct contact. Inferior alveolar nerve in 27.1% of scans was placed inferior to the mandibular 3rd molar with 57.8% having direct contact. In the remaining 8.6% of scans, Inferior alveolar nerve were present in the interradicular position with 100 percent having direct contact. P- value of buccal and interradicular position was found to be significant($p<0.05$)
Conclusion: Cone Beam Computed Tomography is a precise tool for the preoperative assessment of patients undergoing the extraction of mandibular third molar.
Keywords: Inferior alveolar nerve, Cone Beam Computed Tomography, Mandible, Radiation, Ionizing, Paresthesia

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INTRODUCTION

The relative position of inferior alveolar nerve (IAN) with mandibular third molar is of importance in the surgical procedures of mandibular 3rd molar. The IAN is located within a canal in the mandible called the inferior alveolar canal supplying the mandibular teeth[1]. IAN is located in a number of positions relative to mandibular third molar. These include buccal, lingual, inferior and interradicular with the nerve having either direct contact with the mandibular 3rd molar or no contact[2]. IAN is involved in most of the surgical procedures performed by surgeons in the mandibular third molar area and can have a number of post-operative complications[3]. IAN can be damaged while performing surgical procedures in the area around the third molar due to proximity of the roots of mandibular third molar with IAN and result in paresthesia of the nerve[4].

Two-dimensional radiograph such as Orthopantomogram (OPG) is commonly used as a diagnostic tool for the preoperative assessment of IAN. OPG provide limited information about the structure of the roots of mandibular 3rd molar and its relationship with the IAN[5]. Cone beam computed tomography (CBCT) has recently been developed for the assessment of dental soft and hard structures[6]. Computerized tomographic scan is a precise tools to assess the anatomical details of a particular area[7]. It gives images in the sagittal, axial and coronal planes and can give a 3-dimensional picture[8]. Several international studies have been conducted on relationship of IAC with mandibular third molar using CBCT. Gu L. et al. have found CBCT to be accurate in providing 3 dimensional images of dental hard and soft structures[9]. However, to the best of our knowledge, in Pakistan limited information about the positionof IAN and its relationship with the mandibular 3rd molar using CBCT is present. These studies are important as they will give valuable data which can help surgeons to avoid complications while

1. Demonstrator of Oral Biology
2. Assistant Professor of Oral Biology
3. Assistant Professor of Oral Pathology

Rehman College of Dentistry, Peshawar.

Correspondence:
Sobia Salam
Demonstrator of Oral Biology,
Rehman College of Dentistry, Peshawar
Email: sobiasalam1990@gmail.com

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performing surgical procedures on mandibular 3rd molar.
Rationale of conducting this study is that CBCT is precise in the preoperative assessment of IAN with mandibular third molar. Evaluation of the exact position of mandibular third molar and IAN preoperatively is important to avoid nerve injury. So, this study was conducted with an objective to evaluate the relative position of mandibular third molar with inferior alveolar nerve using cone beam computed tomography.

METHODOLOGY

This descriptive cross-sectional study which was carried from 1st December 2016 to 30th April 2019 at the Department of Oral Biology, Rehman College of Dentistry, Peshawar. Non probability consecutive sampling was performed. Sample size of 140 was calculated by using WHO sample size calculator. Inclusion criteria was dentate patients above 16 years of age of both genders having a mandibular 3rd molar. Patients with pathological conditions and developmental anomalies of the mandible with history of surgeries in the area were excluded. CBCT scans of the mandible taken from RCD radiology were acquired by authors using a CBCT scanner (care stream, Germany, model no. Cs 90003D) at a higher resolution and medium volume. The parameter for operating were 10mA and 90Kv with focal spot fixed 0.5mm and field of view at 18X16cm. Relative Position of IAN and mandibular 3rd molars were categorized into Buccal, Lingual, Inferior and Inter radicular positions having direct contact or no contact between lower third molars and IAN. CBCT scans were analyzed by 3 examiners to remove bias who had a minimum of 3 years' experience with CBCT.

Data Analysis: The collected data was analyzed by SPSS version 22 software. Descriptive statistics were used for variables like age and gender. Frequencies and percentages were calculated for categorical variables like Buccal, lingual, inferior and interradicular positions having direct or no contact between IAN and mandibular 3rd molar. Direct or no contact was stratified among positions of IAN and Pearson chi square test was applied. Differences were considered to be significant at a p value < 0.05.

RESULTS

Amonge the 140 CBCT scans, mean age of patients was 29.81 ± 9.51 years with a range of 18-54 years. Out of these 57.1% were males where as 42.9% females(Table-I).

Table-I: Age and gender distribution(N=140)

Age	Gender
mean(±SD): 29.81±9.51	Male 57.1%(80)
Range:18-54	Female 42.9%(60)

In 47.1%(n=66) of cone beam computerized scans, Inferior alveolar nerve was present buccal to the mandibular 3rd molar with 27%(18) having direct contact. 17.1%(24) scans had Inferior alveolar nerve present lingual to the mandibular third molar with 41.6%(10) having direct contact. Inferior alveolar nerve in 27.1%(38) of scans was placed inferior to the mandibular 3rd molar with 57.8%(57.8%) having direct contact. In the remaining 8.6%(12) of scans, Inferior alveolar nerve were present in the interradicular position with 100%(12) percent having direct contact(Table-II).

Table-II : Frequency of different Position of IAN in relation to Mandibular third Molar(N=140)

Position of IAN	Total	Direct contact	No contact	p-value
Buccal	47.1%(66)	27%(18)	73%(48)	0.0001
Lingual	17.2%(24)	41.6%(10)	58.4%(14)	0.825
Inferior	27.1%(38)	57.8%(22)	42.2%(16)	0.057
Interradicular	8.6%(12)	100%(12)	0%(0)	0.0001
Total	100%(140)	44.28%(62)	55.72%(78)	

DISCUSSION

Several methods have been used to assess the proximity of IAC to the mandibular 3rd molar. Orthopantomgram was extensively used in the past for the preoperative assesment of mandibular 3rd molar area before any surgical procedure but it has its limitations. OPG is basically a two dimensional image of 3 dimensional anatomical structure and does not give the exact anatomical detail[10]. Technological advances have made it possible for computerized tomographic scans to be used in the preoperative assessment of head and neck area. CBCT offers significant advantages over conventional radiographs. They produce undistorted 3-dimensional images of dental structures and is an accurate analysis of the 3-dimnesional reconstructed images of dental structures[11]. With every imaging modality there is inherent risk of ionizing radiation damage, but risk should always be weighed against benefit. Radiation produced by CBCT is considered safe in the oral and maxillofacial region and it can greatly improve treatment outcomes[12].
In this study the IAN was buccally located to the third molar in 47.1% of scans as observed on CBCT. Out of these 27% were in direct contact with IAN which is stastically significant (p=0.0001). This result is in conflict with Study carried out by Gu L et al. who have found 7.9% IAN buccal to mandibular 3rd molar[9].
The IAN was found inferiorly to mandibular third molars in 27.1%cases with 57.8% in direct contact with the mandibular third molars. This is in accordance with a study conducted by Wang WQ Et al[13].
The IAN were found lingually in 17.2% of cases in which 41.6% were in direct contact with the mandibular third molars. Maglione M et al. have demonstrated similar prevalence in their studies [14].
The presence of IAC in interradicular position was observed in 8.6% of cases, all of which had direct contact with the mandibular third molar. This result is stastically significant(p= 0.0001). This result is consistent with other studies which have shown direct contact of IAN and mandibular 3rd molar in interradicular position to be 85% and 94% respectively[15,16].
Some of the differences in our results could be due to sample size and demographic variations. Most of the studies on position of IAN relative to mandibular 3rd molar are done internationally with very limited local data.

Neurosensory disturbances and damage to IAN after surgical procedures in mandibular 3rd area is a common complication. This can lead to functional deficit and can effect the quality of life. Preoperative assessment of position of IAN is important for the surgeon to avoid IAN injury before starting any surgical procedure.

CONCLUSION

Cone Beam Computed Tomography is a precise tool for the preoperative assessment of patients undergoing the extraction of mandibular third molar.

AUTHOR'S CONTRIBUTION

Salam S: Conceived idea, Literature Search, Manuscript writing.
Rehman AZU: Data Interpretation, Statistical Analysis
Alam S: Designed Research Methodology.
Jamil Y: Data collection
Irshad M: Manuscript final reading.

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