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Research Article

A PANORAMIC RADIOGRAPHIC STUDY: RISK PREDICTIVITY OF IMPACTED MANDIBULAR THIRD MOLAR WITH INFERIOR ALVEOLAR CANAL

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ABSTRACT:

AIM:To assess the proximity of impacted mandibular third molars to the inferior alveolar canal and determine the reliable radiographic risk predictor signs that indicate the same on panoramic radiographs.
METHOD: The radiographs were interpreted for presence of radiographic risk predictor signs i.e. Interruption of radiopaque border of the canal, Darkening of the root, Developing root, Diversion of canal, Deflection of root by the canal, Bifid apex, Narrowing of diameter of canal, Narrowing of the root, Interruption of alveolar lamina dura.
RESULT: Maximum number of impaction was found bilaterally. The greater number of involvement of third molar root with inferior alveolar canal was found to be darkening of root i.e. in 362 and least number was interruption of periodontal ligament and lamina dura.
CONCLUSION: An accurate radiographic diagnosis is essential to evaluate and predict the possible outcome related to impacted third molar removal. OPG is feasible and cost effective which allows the vertical and two dimensional relationships between the tooth and the IAC to be assessed.

Keywords: Mandibular**,** third molar, radiographic study

INTRODUCTION

Impacted mandibular third molar removal is one of the most common procedures performed in department of oral and maxillofacial surgery. Extraction of mandibular third molar can be easily performed using forceps, but it may require surgical intervention which increases the risk of complications, such as nerve paresthesia, alveolar osteitis, hemorrhage, or even fracture of the jaw [1]. The frequency of inferior alveolar canal injury during mandibular third molars removal varies from 0.6% and 5.3%. The risk of

permanent inferior alveolar canal injury is less than 1% [2]. These complications can be predictable prior to surgery with the help of radiographs, which can be used as a guide for surgeon to avoid neurosensory disturbances. Currently, the panoramic radiograph is the technique of choice to evaluate impacted mandibular third molars. The estimated sensitivity for radiographic signs, as predictor of nerve injury ranges from 24% to 38%, and the specificity ranges from 96% to 98% [3]. So, panoramic radiography allows an initial evaluation of any complication associated with impacted mandibular third molar [4].Consequently, this study was designed with an aim toassess the proximity of impacted mandibular third molars to the inferior alveolar canal and determine the reliable radiographic risk predictor signs that indicate the same on panoramic radiographs.

Materials and Methods

Ethical clearance was obtained from the Institutional Ethical Committee prior to conducting the study. The radiographs were interpreted for presence of radiographic risk predictor signs i.e. Interruption of radiopaque border of the canal, Darkening of the root, Developing root, Diversion of canal, Deflection of root by the canal, Bifid apex, Narrowing of diameter of canal, Narrowing of the root, Interruption of alveolar lamina dura, Adjacent, Superimposition and None (Rood and Saheb classification 1990 with modification according to A M Hazza 2006). The panoramic radiographs were made from OPG machine with following specification.

- Specification: Cone Beam 3D Imaging NewTomGiano CBCT machine (extended volume).
- Name- NewTom, Verona (Italy)
- OPG - Optical fiber Sensor (CCD)
- Input Voltage - 230/240 v
- Tube Voltage- 70kvp
- Tube Current (mA)- 10.00mA
- Time scan - 13.60 second

Software used - NNT version 6.1 (installation package: 6.1.0) QR Sri Company, Verona, Italy

Inclusion Criteria

- Patients with 17 to 50 years of age of both gender having impacted mandibular third molar.
- Individuals presenting with unilateral or bilateral impacted mandibular third molars.
- **C**onsent from patients was taken so that their scan could be used for research purpose.

Exclusion Criteria

- Patients with benign or malignant lesions around the impacted mandibular third molar.
- Patients with displacement of molar due to pathology, such as cysts or tumors.
- Panoramic radiographs that did not allow a clear interpretation of the relationship of the impacted mandibular third molar to inferior alveolar canal.
- Patient without impacted mandibular third molar.
- Patients undergoing orthodontic treatment.

Statistical Analysis

The data was entered into the computer database. The response of frequencies was calculated and analyzed by using statistical software statistical package of social sciences (SPSS) version 19.0 IBM, U.S. The probability value $p<0.05$ was considered as significant, and $p<0.001$ was considered as highly significant and value $p>0.05$ was considered as not significant. Statistical analysis of the observations of third molar angulations, relationship of inferior alveolar canal with impacted third molar, relationship of inferior alveolar canal with angular position of mandibular third molar, age-wise, gender-wise and side-wise relation of impacted mandibular third molar with inferior alveolar nerve was done. Also age-wise, gender-wise and side-wise effect of impacted mandibular third molar on second mandibular molar was carried out to find the significant difference.

RESULTS

Maximum number of impactions were found bilaterally. In the age group of 17-33 years the number of impacted teeth bilaterally was found to be 520 (.7%) and in the age group of 34-50 years it was found to be 119 (44.9%).Maximum number of impacted teeth were found in age group 1 i.e. 735. The distribution of impacted mandibular third molar in relation to side and age of the patient was statistically highly significant with p value 0.0001 ($p<0.001$) interpreted by chi-square test.

Males had greatest number of impacted teeth bilaterally 343 (62.8%).The distribution of impacted mandibular third molar in relation to side and gender of the patient was not found to be statistically significant with p value 0.519 ($p<0.001$) by chi-square test.

The greater number of involvement on right side was darkening of root 175 (17.5%), according to Rood and Saheb classification (1990) and adjacent 120 (12.0%), according to A M Hazza (2006).

Patients in the age group of 17-33 years had the greatest number of involvement with inferior alveolar canal.

The greater number of involvement of third molar root with inferior alveolar canal was found to be darkening of root i.e. in 362 and least was interruption of periodontal ligament and lamina dura i.e. 0 case. The p-value was 0.0001($p<0.05$), highly significant. The degree of freedom was 1. So, the relationship between inferior alveolar canal and mandibular third molar root in each category according to age was found to be statistically highly significant.

On the right side in males, most of the involvement was darkening of root i.e. 85 cases (19.4%) and least was interruption of periodontal ligament and lamina dura i.e. 2 case (0.5%).On the left side, most of the involvement was darkening of root i.e. 84 cases (18.6%) and least was interruption of periodontal ligament and lamina dura i.e.1 case (.2%)**.**

The maximum involvement of third molar root with inferior alveolar canal was found to be darkening of root and least was interruption of periodontal ligament and lamina dura **(Fig 11)**. The p value was 0.004 ($p<0.05$) which was significant. The degree of freedom was 1. So, t**he relationship between inferior alveolar canal and mandibular third molar root** in each category according to gender was found to be statistically significant.

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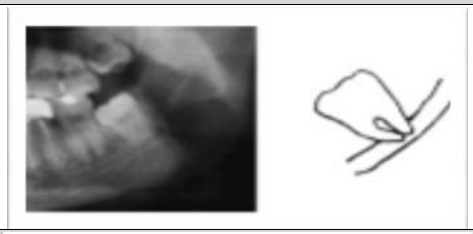
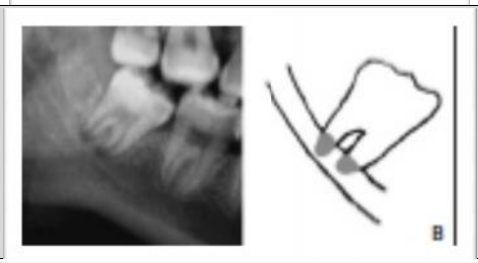
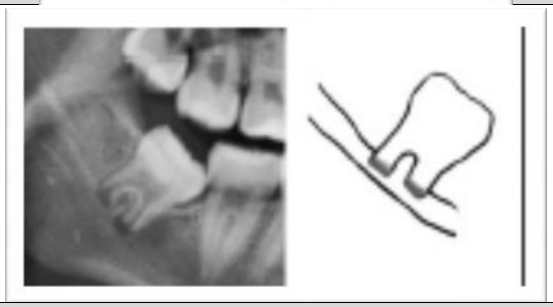
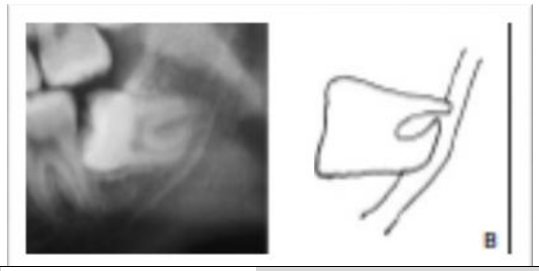
ROOD AND SHEHEB CLASSIFICATION(TRUE RELATIONSHIP)		
TYPES	***DESCRIPTION***	***PICTURE***
1. Interruption of the radiopaque border of the canal:	Represents IAN is discontinuous as impacted mandibular thirdmolar root was located within the canal.	
2. Darkening of the root:	Represents IAN crosses the impacted mandibular third molar, an increased radiolucency is detected.	
3. Developing roots	The roots of the impacted mandibular third molar still are developing.	
4. Diversion of the canal:	Represent bending of canal in proximity to the root of impacted mandibular third molar	
5. Deflection of the root by the canal:	The root appeared to be deflected around the canal.	
6. The bifid apex:	The apex of the toot appeared bifid where the canal crossed it.	

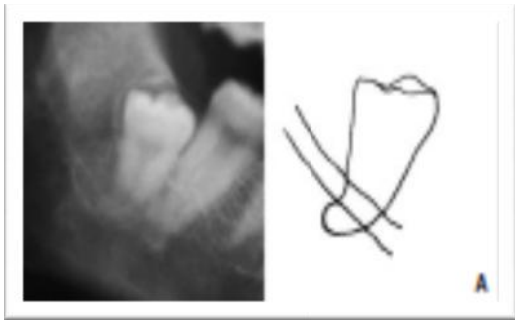
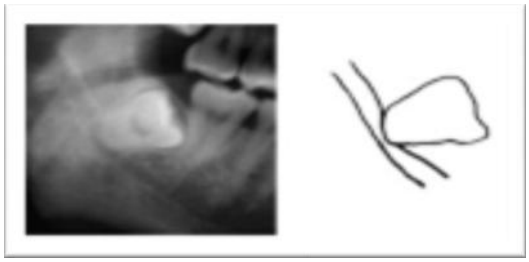
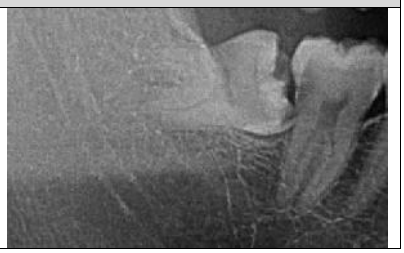
7. Narrowing of diameter of the canal:	The canal narrowed due to disturbance by the root of impacted mandibular third molar.	
8. Narrowing of the root:	Like a waist where the canal crossed it.	
9. Interruption of the alveolar lamina dura and periodontal space:	The image of the alveolar lamina dura and periodontal space was discontinuous and blurry where the impacted mandibular third molar superimposed on it.	

Fig 1: Classification: ROOD *AND SHEHAB CLASSIFICATION(TRUE RELATIONSHIP*[5]

SUBDIVISION Hazza'a AM (2006)(FALSE RELATIONSHIP)[6]		
TYPES	***DESCRIPTION***	***PICTURES***
10. Adjacent	The superior border of the canal as either touching the root apices or within 2mm below them.	
11. Superimposition	The canal was superimposed over part of the roots which appeared less radiopaque than the remaining radiological image of the roots.	
12. None	A relationship between the canal and the root apices could not be decisively assessed.	

SIDE-WISE DISTRIBUTION OF IMPACTED MANDIBULAR THIRD MOLAR ON PANORAMIC RADIOGRAPH, ACCORDING TO GENDER GROUP

RADIOGRAPHIC SIGNS	Frequency		Percent		Valid Percent		Cumulative Percent	
	R	L	R	L	R	L	R	L
1	**175**	**187**	17.5	18.7	21.5	22.7	21.5	22.7
2	120	**120**	12.0	12.0	14.7	14.6	36.2	37.3
3	**151**	**120**	15.1	12.0	18.5	14.6	54.7	51.8
4	18	20	1.8	2.0	2.2	2.4	56.9	54.2
5	41	38	4.1	3.8	5.0	4.6	62.0	58.9
6	4	9	.4	.9	.5	1.1	62.5	60.0
7	38	39	3.8	3.9	4.7	4.7	67.1	64.7
8	34	31	3.4	3.1	4.2	3.8	71.3	68.4
9	3	3	.3	.3	.4	.4	71.7	68.8
10	**120**	115	12.0	11.5	14.7	14.0	86.4	82.8

11		67	99	6.7	9.9	8.2	12.0	94.6	94.8
12		44	43	4.4	4.3	5.4	5.2	100.0	100.0
Total		815	824	81.5	82.4	100.0	100.0		
Missing	**System**	185	176	18.5	17.6				
Total		1000	1000	100.0	100.0				

Distribution of impacted mandibular third molar side-wise, according to ROOD AND SAHEB CLASSIFICATION 1990 with modification according to A M HAZZA 2006

1: Darkening of root
2: Developing of root
3: Interruption of radiopaque line
4: Deflected canal
5: Deflected root
6: Bifid root
7: Narrowing of canal
8: Narrowing of root
9: Interruption of lamina dura and PDL
10: Adjacent
11: Superimposition
12. None

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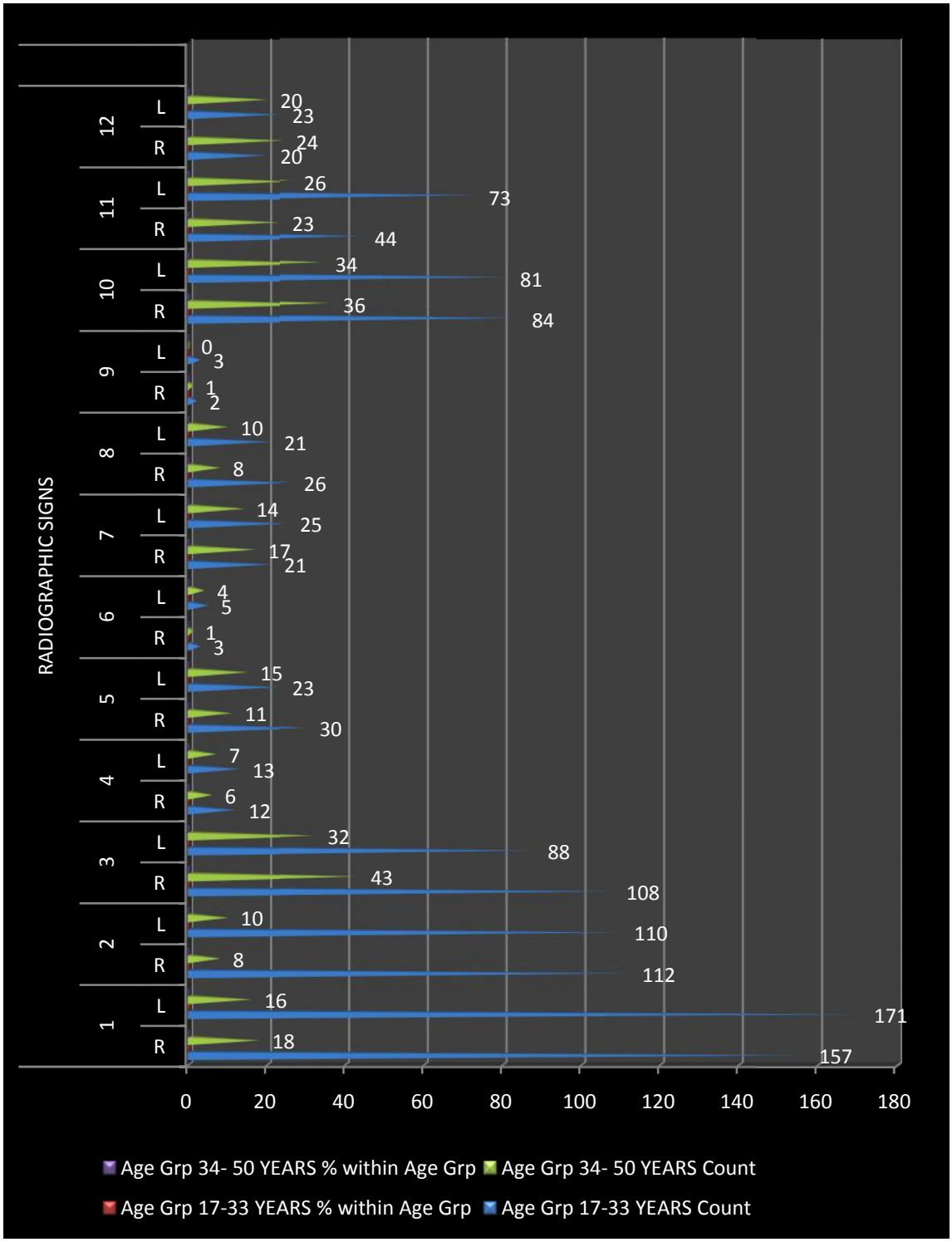

Distribution of impacted mandibular third molar age-wise, according to ROOD AND SAHEB CLASSIFICATION 1990 with modification according to A M HAZZA 2006

Fig 8: BILATERAL IMPACTION (MOST COMMON)

Fig 10: DARKENING OF ROOT (MOST COMMON INVOLVEMENT)

Fig 11: INTERRUPTION OF PERIODONTAL LIGAMENT AND LAMINA DURA (LEAST COMMON INVOLVEMENT)

DISCUSSION

An impacted tooth is one that is erupted, partially erupted or unerupted and will not eventually assume a normal arch relationship with the other teeth and tissues.[7]It has been recognized as a dental health problem since dentistry was first recognized as a learned health profession. Fulminating pericoronitis in a partially impacted "wisdom tooth" was perhaps the single indication for removal, provided the patient could withstand the rigors of the surgery.

Accurate assessment of the position of the inferior alveolar nerve in relation to the impacted third molar might reduce injuries to this nerve. Various preoperative radiographic techniques to evaluate the relation between the mandibular third molar and the inferior alveolar canal have been used. Extraction of impacted mandibular third molar is considered a great challenge and having higher risks to cause severe complications.[8]The proximity and positional relation between the tooth root and the IAC are the most important risk factors reflecting the risk degree and helping the surgical plan .[8-9] Clinical studies have identified radiographic signs on panoramic radiographs that indicate a high risk of IAN exposure or IAN injury following third molar removal.[10,11]In the current study, the relationship of impacted mandibular third molar with inferior alveolar nerve was evaluated according to Rood and Shehab (True relationship)(1990)[10]&

Subdivision i.e. False relationship(according to Hazza'a AM)[12] in Panoramic radiograph (2006).

The study subject was divided into 2 age groups: (GROUP 1) 17-33 years (GROUP 2) 34-50 years and were distributed as 735(73.5%) in age group 1 and 265 (26.5%)in age group 2 on panoramic radiograph. The mean age of male and females was found to be 27 years. Maximum cases of impaction were reported in age group I (17-33years) which concluded that cases of impactions were more prevalent in young age group.

Studies conducted by Sandhu S.S. and Kapila B. K[14](1982), Hazza'a et al[12] (2006), Saad SS et al [13](2012) also showed highest incidence of impacted third molar i.e. (157 in their 1010 samples in of age group:17-25 years), (20-25 years showed 1044 in 2526 subjects), (21-25 years age groupshowed 66 in 100 subjects) respectively. Many impacted third molars can change their position and erupt by the middle of the third decade. This indicates thatwith age the arch length increases and the space available for eruption of the impacted tooth increases. So, the incidence of impaction decreases with age.

In our study, maximum number of impactions were found bilaterally which was in accordance with the study conducted by Hazza'a AM et al[12](2006), who found bilateral impaction (1167 i.e. 85.9%). Similar studies conducted by Kaka IN[15](2008) and Saad SS et al[13] (2012) also reported maximum cases of bilateral impactions. Hence bilateral impaction was considered most common type of impaction, on comparing present study with other studies.

In our study, the distribution of impacted mandibular third molar in relation to side and age of the patient (i.e. bilateral and in age group I) was statistically highly significant ($p<0.001$) which was in accordance with Saad SS et al[13] (2012) who reported 71% of mandibular third molar with bilateral impaction in the age group between 21-25 years and demonstrated a degree of symmetrical configuration and disagreed with the results of Hazza'a AM et al[12] (2006), who found only a small minority of bilateral impaction, in age group (20-25 years).

In our study, in the patients in the age group I,maximum involvement was found to be darkening of root 328 (51%) and least was the interruption of lamina dura and periodontal ligament 5 (0.8%). In the patients in the age group 2 maximum involvement was found adjacent 40 (37%) and least was the interruption of lamina dura and periodontal ligament 1(0.5%). The p value was found to be 0.0001, which showed that the relationship between inferior alveolar canal and mandibular third molar root according to age was statistically highly significant.

CONCLUSION

This study compared the relationship of roots of impacted tooth with IAC (12 categories, according to Rood and Shehab and subdivision Hazza'a AM) on OPG. An accurate radiographic diagnosis is essential to evaluate and predict the possible outcome related to impacted third molar removal. OPG is feasible and cost effective which allows the vertical and two dimensional relationships between the tooth and the IAC to be assessed.

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