



## RELATIONSHIP OF IMPACTED THIRD MOLAR WITH INFERIOR ALVEOLAR NERVE: - A RETROSPECTIVE STUDY

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### ABSTRACT

**Purpose-** Present Retrospective study have been done to find the reliability of panoramic radiographs on determining the proximity of mandibular third molar root with inferior alveolar nerve canal and radiographic risk predictors.

**Methods-** Retrospective study was performed on 101 subjects with total of 150 impaction of mandibular third molar. OPGs were obtained from previous data. The radiographs were interpreted for type of impaction, angulation of impacted tooth in jaw, side predominance and gender predominance

**Result-** The mean age of impaction obtained was 28.32 years with its p value 0.116. Male predominance was seen with 67.33% cases with p value 0.728. Amongst angulation mesioangular impaction had maximum number of cases (48.66%). Interruption of white lines was most significant radiographic risk predictors with 25.33% cases.

**Conclusion-** Panoramic radiography is a reliable diagnostic aid in estimating the proximity and risk factors associated with third molar surgery. Mesioangular impactions are more common and interruption of white line to be the most reliable risk predictor.

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### INTRODUCTION

According to Phylogenetic theory, nature tries to eliminate the disused organs i.e. disuse cause slow regression of that organ. Due to changing nutritional habits of our civilization, use of large powerful jaws has been practically eliminated. Thus over centuries the mandible and maxilla decreased in size leaving insufficient room for third molar. The last tooth to erupt in the oral cavity is known as wisdom tooth or 3<sup>rd</sup> molar. First evidence of calcification of mandibular 3<sup>rd</sup> molar is seen at the age of 8-10 years, with its crown completion at the age of 12-16 years<sup>(1)</sup>. Mandibular 3<sup>rd</sup> molar erupts at the age of 17-21 years of age with root completion between the ages of 18-25 years.

Some mandibular 3<sup>rd</sup> molar remains partially or completely impacted within the bone, which is mainly due to tooth material-arch length discrepancy. According to Archer (1975) "The tooth that fails to erupt in oral cavity in its functional position and which has lost its further potential to erupt is called as impacted tooth". Mandibular 3<sup>rd</sup> molar are most frequently impacted tooth in oral cavity. Its impaction is often associated with many complications and pathoses like cyst formation, granuloma, abscess, and angle fracture etc.

including neurosensory disturbances which are due to proximity of tooth to inferior alveolar nerve. With decrease in the proximity there is increase in the prevalence of inferior alveolar nerve paraesthesia following 3<sup>rd</sup> molar surgery. This makes assessment of proximity of mandibular 3<sup>rd</sup> molar with inferior alveolar nerve canal essential. To prevent any complication following 3<sup>rd</sup> molar surgery and to have a proper treatment planning, an optimum diagnostic aid is needed. Panoramic radiography i.e. OPG (orthopantomogram) is used to evaluate proximity and risk factors associated with 3<sup>rd</sup> molar surgery.

Other better diagnostic aids are available like CBCT, however owing to the benefit of availability, less chances of infection spread, higher patient's compliance, less radiation exposure, more diagnostic property, and being more economic, Panoramic Radiography is employed in following study as diagnostic aid for determining proximity between impacted 3<sup>rd</sup> molar and inferior alveolar nerve.

### MATERIALS AND METHODOLOGY

#### Material Required

In a retrospective study we used 150 radiographs (OPG) of patients of either sex between the ages of 15-75 years, who in

past visited to the department of oral medicine and radiology of Vyas dental college and hospital, Jodhpur.

**Inclusion Criteria:** -The criteria that were included are individual impacted 3<sup>rd</sup> mandibular molars, good quality radiographs, developing tooth with abnormal position in the jaw and partial or complete edentulous patient with remaining impacted 3<sup>rd</sup> molar.

**Exclusion Criteria:** -The exclusion criteria were bad quality radiographs, TMJ pathoses, developmental abnormalities affecting the jaw, and pathoses involving 3<sup>rd</sup> molars.

**METHODOLOGY**

The type of impaction was identified by modified Winter’s classification. According to this classification system the relationship of mandibular 3<sup>rd</sup> molar and inferior alveolar nerve is determined by presence of signs like darkening of root, interruption of white line, diversion of canal, deflection of the root, narrowing of root, narrowing of canal, presence of dark and bifid root apex.

For this study, few modifications are done in the above classification system in which few criteria are added which include superimposition of root apex on canal, root apex being adjacent to the nerve canal and presence of developing root with its abnormal position in the jaw. Simultaneously, impaction according to tooth angulation in the jaw is also classified as horizontal, vertical, mesioangular and distoangular.

**Aim and Objectives**

Relation between impacted mandibular 3<sup>rd</sup> molar root with Inferior alveolar nerve.

**Objecives**

Radiographic risk prediction of complications while extraction. Prevalence of type of impaction.

Relationship of prevalence according to age and sex of individuals.

**RESULT**

Present retrospective study were done over 150 orthopentamograms taken from Out Patient Department of Vyas Dental College and Hospital to find out the relationship between impacted mandibular 3<sup>rd</sup> molar root with inferior alveolar nerve canal.

After careful observation and statistical analysis it was found out that out of 150 impactions 49 impactions i.e. 32.66% were found in females with mean age of 25.95 years and standard deviation of ± 10.33 years. Whereas 101 impactions i.e. 67.33% were found in males with mean age of 29.46 years with a standard deviation of ± 13.73 years. Overall mean of male and female patient’s age came out to be 28.32 years with its standard deviation to be ± 12.79 years. ANOVA and P value of this statistics came out to be 2.50 and 0.116 respectively. (Table- 1)

**Table-1** Prevalence of impaction in relation to age and gender

sex	Gender distribution	Mean Age	Std. Deviation	ANOVA	P-value	Total subject mean age and its standard deviation
Female	49(32.66%)	25.9592	10.33392	2.503	0.116	Mean-28.32 SD-12.79
Male	101(67.33%)	29.4653	13.73140			
Total	150	28.3200	12.79331			

In order to decide side predilection, statistics to find relation between gender and their side distribution of impaction was done. With the study it was evident that number of impaction

in left and right sides were equal i.e. 75 (50%). In females there were 23 cases i.e. 46.93% of right molar impaction and 26 cases i.e. 53.06% of left molar impaction making total of 49 impactions (32.66%) in females. In males there were 52 cases of right molar impaction i.e. 51.14% and 49 cases i.e. 48.51% of left molar impaction. P value of this study came out to be 0.728. (Table- 2)

Determination of relation of type of impaction with gender was done to found out that there were total 51 cases i.e. 34% of horizontal impaction, 26 cases i.e. 17.33% of vertical impaction, 73 cases i.e. 48.66% of mesioangular impaction and there were no cases of distoangular impaction. Out of total 49 cases of impaction in females 29 cases i.e. 59.1% of impaction was mesioangular followed by 13 cases i.e. 26.5% of horizontal impaction and 7 cases i.e. 14.4% of vertical impaction and there were no cases of distoangular impaction. Out of total 101 impaction cases in males 44 cases i.e. 43.56% were recorded to be of mesioangular impaction, followed by 38 cases i.e. 37.6% of horizontal impaction and 19 cases i.e. 18.81% of vertical impaction. (Table- 3)

According to both the classification criteria of impaction considered in this study, the maximum prevalence is of interruption of white line (Fig 1) with total of 38 cases i.e. 25.33% were seen with 19 cases (50%) mesioangular impaction followed by 14 cases (36.8%) of horizontal impaction and 5 cases (13.15%) of vertical impaction;



**Fig: 1** Interruption of radiopaque line of inferior alveolar nerve

followed by interruption of white line there were 23 cases of root being adjacent to nerve canal with maximum of horizontal impaction i.e. 17 cases (73.91%), followed by 5 cases (21.73%) of mesioangular and 1 case (4.34%) of vertical impaction; there were total 22 cases i.e.14.66% of diversion of canal with 11 cases (50%) mesioangular followed by 8 cases(36.36%) of horizontal and 3 cases (13.6%) of horizontal impaction; 15 cases i.e. 10% of probable impactions were seen with developing roots, with 10 cases(66.6%) of mesioangular followed by 3 cases (20%) of vertical and 2 cases (13.33%) of horizontal impactions; there were 13 i.e. 8.66% cases of darkening of root with 11 cases (84.61%)

mesioangular impaction followed by 1 case (7.69%) of horizontal and vertical impaction and superimposition of root on canal with 7 cases (53.84%) of mesioangular followed by 5

cases (38.46%) of vertical impaction; 12 cases i.e. 8% were of narrowing of canal with 7 cases (58.33%) of mesioangular followed by 4 cases (33.33 %) horizontal impaction; 7 cases i.e. 4.66% of dark and bifid root apex with 4 cases (57.14%) of vertical, 2 cases (28.5%) of horizontal and 1 case of mesioangular impaction is seen; 5 cases i.e. 3.33% of deflection of root with 2 cases(40%) of both horizontal and vertical impactions and 1 case(20%) of mesioangular impaction and 2 cases i.e. 1.33% of narrowing of root with 1 case(50%) of vertical and mesioangular impactions. (Table- 4)

**Table 2** Side prevalence of impaction

Sex	Side distribution		Total	Pearson Chi-Square	P-value
	Right	Left			
Female	23(46.93%)	26(53.06 %)	49 (32.66 %)	.273	.728
Male	52 (51.14 %)	49 (48.51 %)	101 (67.33 %)		
Total	75 (50%)	75 (50%)	150		

**Table 3** Relation of type of impaction with gender distribution

Sex	Side distribution				Total
	Horizontal	Vertical	MA	DA	
Female	13(26.5%)	7(14.4%)	29(59.1%)	0	49(32.66%)
Male	38(37.6%)	19(18.81%)	44(43.56%)	0	101(67.33%)
Total	51(34%)	26(17.33%)	73(48.66%)	0	150

**Table 4** Prevalence of impaction with classification criteria

Sign	Side distribution				Total
	Horizontal	Vertical	MA	DA	
Darkening of root	1(7.69%)	1(7.69%)	11(84.61%)	0(0%)	13(8.66%)
Interruption of white line	14(36.8%)	5(13.15%)	19(50%)	0(0%)	38(25.33%)
Diversion of canal	8(36.36%)	3(13.6%)	11(50%)	0(0%)	22(14.66%)
Deflection of root	2(40%)	2(40%)	1(20%)	0(0%)	5(3.33%)
Narrowing of root	0(0%)	1(50%)	1(50%)	0(0%)	2(1.33%)
Narrowing of canal	4(33.33%)	1(8.33%)	7(58.33%)	0(0%)	12(8%)
Dark & Bifid root apex	2(28.5%)	4(57.14%)	1(14.28%)	0(0%)	7(4.66%)
superimposition	1(7.69%)	5(38.46%)	7(53.84%)	0(0%)	13(8.66%)
Adjacent	17(73.91%)	1(4.34%)	5(21.73%)	0(0%)	23(15.33%)
Developing root	2(13.33%)	3(20%)	10(66.6%)	0(0%)	15(10%)
Total	51(34%)	26(17.33%)	73(48.66%)	0(0%)	150

**DISCUSSION**

Impacted mandibular third molar surgery being a major cause of many pathoses involving temporary or permanent sensory alteration demands a careful examination of proximity between inferior alveolar nerve canal and impacted third molar root. The incidence of IAN injury from surgical removal of mandibular third molar varies from 0.4% to 8.4 %.<sup>(2)</sup> Panoramic radiography having an advantage in its ease of availability and its cost efficiency makes it a reliable diagnostic aid for the present study. According to the data obtained from statistical analysis, the mean age of impaction was detected to be 28.32 which is in similar to the study done by Prasannasrinivas D *et al*<sup>(3)</sup>, Mwaniki<sup>(4)</sup> and Gupta *et al*<sup>(5)</sup> and is comparable to study done by Knutsson *et al*<sup>(6)</sup> and Nordenram *et al*<sup>(7)</sup>.

Male predilection with 67.33% has been demonstrated in this particular study which is similar to the results obtained from the studies of Prasannasrinivas D *et al*<sup>(3)</sup>, and Gupta *et al*<sup>(5)</sup> In contrast to this, studies were done by Jerjes *et al*<sup>(8)</sup>, Knutsson *et al*<sup>(6)</sup> and Szalma *et al*<sup>(9)</sup> founded female predominance. Unlike to studies by Prasannasrinivas D *et al*<sup>(3)</sup>, Gupta *et al*<sup>(5)</sup>, and Tay and Go<sup>(10)</sup>, this study does not reveal any side predominance.

Amongst type of impaction based on angulation of tooth in the jaw, mesioangular impaction predominates with 48.66% which is in coordinance with studies by Prasannasrinivas D *et al*<sup>(3)</sup>, Mwaniki *et al*<sup>(4)</sup>, Knutsson *et al*<sup>(5)</sup>, Sedaghatfar *et al*<sup>(11)</sup>, Gomes *et al*<sup>(12)</sup>, and Reddy and Prasad<sup>(13)</sup>.

By many authors panoramic radiographs are assumed to be standard diagnostic tool in the preoperative assessment of mandibular third molar and their relationship with inferior alveolar canal<sup>(3, 14, and 15)</sup>. And have been advocated as radiograph of choice where facility is available<sup>(16)</sup>. As the etiquette, Finnish Student Health Service in Helsinki proposes use of advanced imaging techniques only when panoramic radiographs suggest close relationship between two<sup>(17)</sup>. Apart from this, meta-analysis by Atieh<sup>(18)</sup> determined the diagnostic accuracy of panoramic radiographic markers in detection of relation between root of impacted mandibular third molar and inferior alveolar nerve canal.

This study found ‘*interruption of white line*’ to be the most reliable (25%) radiographic risk predictor sign. Other studies using different diagnostic aid like the study by Ghaeminia *et al*<sup>(14)</sup> found similar observation in their CBCT study. Nakagawa *et al*<sup>(19)</sup> recorded 86% cases with *interruption of white line* on panoramic radiography. Umar *et al*<sup>(20)</sup> also recorded similar findings.

Root being ‘*adjacent*’ to the canal was also observed to be significant followed by ‘*diversion of canal*’ unlike the study by Prasannasrinivas D *et al*<sup>(3)</sup> who founded ‘*darkening of root*’. To conclude the study demonstrated that panoramic radiographs are reliable diagnostic aid in determining the proximity of inferior alveolar nerve canal and root of third molar. It was observed that there is male predominance for impaction and mesioangular impaction being most common and its relationship with inferior alveolar nerve canal. The study also conclude the ‘*interruption of white line*’ to be the most reliable radiographic risk predictor.

Presence of radiographic risk predictor on panoramic radiographs should caution the dental surgeon regarding close proximity of two.

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