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Evaluation of Impacted Mandibular Third Molar using Panaromic Radiographs

Hemamalini Balaji , Dr.K.Laliytha
Saveetha Dental College and Hospitals, Chennai

INTRODUCTION:

Removal of mandibular impacted third molars are routine surgical procedure performed by maxillofacial surgeons in dental clinics as well as hospital setups. [1].To prevent complications a useful diagnostic tool is needed that can determine the relationship between inferior alveolar nerve and the impacted third molar.[2] The reported frequency of inferior alveolar nerve injury associated with M3 removal ranges from 0.6% to 5.3% but the risk of permanent IAN injury is less than 1% [3–7].Panoramic radiography is suggested as the technique of choice to evaluate impacted third molars as well as to estimate the pre-operative risk for inferior alveolar nerve injury associated with third molar surgery [8]. Smith AC et al., [9] also described panoramic radiography as optimal method for radiological assessment for mandibular third molar teeth prior to their removal. Imaging techniques for impacted mandibular third molars (IM3M s) are as follows: intraoral periapical radiography (IOPA); extraoral techniques like lateral oblique and panoramic methods, skull radiography, computed tomography (CT), among which orthopantomograph (OPG), an adjunct to IOPA, remains the method of choice.
Orthopantomography (means straight broad coverage slice technique) was first proposed by Numata in 1933.[10] Third molar is the most frequently impacted tooth.[11] The prevalence of third molar impaction ranges from 16.7% to 68.6%[.11-21] Most studies have reported no sexual predilection in third molar impaction[11,12,15,17,19] Some studies, however, have reported a higher frequency in white European females [21,22] and Singapore Chinese females than males.[19].Several methods have been used to classify impaction, in which impaction is described based on the level of impaction,[23] the angulations of the third molars,[24] and the relationship to the anterior border of the ramus of the mandible.[23]
Depth or level of mandibular third molars can be classified using the Pell and Gregory classification system,[22] where the impacted teeth are assessed according to their relationship to the occlusal surface of the adjacent second molar. Thus the aim of this study is to Evaluate the Preoperative radiographic and clinical parameters of IM3M to assess Clinical Symptoms, Number of Roots,pattern of Impaction,Level of Impaction,Angilation,relationship of Inferior Alveolar Canal with their roots,and also assessment of any effect on the adjacent tooth structure like Dental Carries or Root resorption

Radiographic technique

The subject was positioned properly in the panoramic machine set up by adopting the principles of Goaz and White.[3] Appropriate kVp and mA parameters were selected and exposures were made. All the films were processed manually in a well-equipped lightproof dark room as described by Goaz and White.[11]

Matetrials and methods-

Of One Hundred And Fifty OPGs ,Eighty Five orthopantomograms (OPG) of patients aged 19 years and older (45males and 40 females) were selected. The remaining 48% were excluded from the study due to lack of fulfilling the Inclusion criteria.
Orthopantomograph of 65 patients visiting department of oral medicine and radiology of our college were selected for the purpose of this study.The radiographs were taken using Digital panaromic machine.

Inclusion Criteria:

The criteria for selection of radiographs are
1-Either unilateral or bilateral mandibular 3rd molar impaction
2-Clinically symptomatic or asymptomatic patients

Exclusion criteria-

Any patient with history of extraction of permanent teeth ,age less than 19 years, mandibular fracture or orthodontic treatment was excluded from the study, also patients with developmental anomalies , congenital or sysetemic diseases and major pathologies like Cleidocranial dysplasia in mandible were excluded, also 3rd molars having underdeveloped roots were excluded.

Method Of Examination:

The patients were clinically examined under aseptic condition and informed consent were obtained. The radiographs were taken according to the panoramic machine specifications which has a constant magnification of 1.2.
The study sample was divided into symptomatic an asymptomatic case.On clinical and radiographic examination ten relevant questions were formulated . Each radiograph was viewed digitally and measurements were made using a digital software called DICOM viewer and Analyser.
Third molar was considered impacted if it was not in functional occlusion and at the same time, its roots were fully formed.Outline of mandibular 1st premolar 2nd premolar, 1st molar, 2nd molar and 3rd molar of the right and left sides were traced. Following Ganss method, occlusal plane was drawn through the tip of the most superior cusps of the 1st premolar and the tip of the most superior mesial cusps of the second molar extending upto anterior border of ramus of the mandible . A perpendicular line is drawn from the occlusal plane touching the most distant point of the second molar. The available third molar space was

determined as the distance between the intersection of the vertical line with the occlusal plane , also the mesio-distal width of the 3rd molar crown was recorded. Based on the above method the impactions are classified as

- Class 1- the available space is more or equal to the mesio-distal diameter of 3rd molar.
- Class2- the availabie space is less then the mesio-distal diameter of the 3rd molar.
- Class 3- if the tooth was located completely within the mandibular ramus(the retromolar space is obliterated because the ascending ramus of the mandible was located immediately posterior to the second molar.

Radiographic analysis also reveals,the levels of eruption

- Level A: When there is crown to crown position between impacted third molar and second molar .
- Level B:When there is crown to cervical position between the impacted third molar and second molar.
- Level C: When there is crown to root position between the impacted third molar and second molar.

Outline of the inferior alveolar canal was traced to record its relation to the third molar root apices.

- Adjacent: When the superior border of the canal was touching the root apices or within 2mm below them.
- Super imposed : When the canal was superimposed over part of the roots which appeared less radioopaque than the remaining radiological image.
- Notching: When there was a radiolucent band at the apex of the roots, a break in the continuity of the upper radio dense border, and narrowing at the expense of the top of the canal was present.
- Grooving : When radiolucent band across the root above apex was present with interruption of both superior and inferior border of the canal, and narrowing of the canal space.
- Perforation: With radiolucent band crossing the root above the apex and loss of both superior and inferior border of the canal at the area where they cross the root , with constriction of the canal maximal in the middle of the root was present.
- None: When there was no relation between the canal and the root apices, condition was recorded.

Number of roots of the IM3M was also recorded from the radiograph. And the Inclination of the third molars were categorized as Mesio Angular,Distoangular,Horizontal and Vertical.In addition any effect on the adjacent tooth structure like Dental caries or External root resorption was also evaluated. OPGs were reviewed by a single examiner in a dark room using an appropriate X-ray viewer to determine the prevalence of impacted third molars in the sample, their levels of eruption; and their angulations. Third molar status was determined based on the patient's chart and the OPG.

Data was analyzed using a Pearson chi-square (χ^2) test, performed using the Statistical Package for the Social Sciences (version 15.0; SPSS, Inc, Chicago, IL). All assessment was done by a single examiner to eliminate inter-examiner errors. Chi-Square test is applied to compare proportions. If any expected cell frequency is less than five then Fisher's Exact Chi-Square test is used. If P-Value < 0.05 then it was considered as Statistically Significant

RESULT:

Distribution based on Age and Sex:

All the IM3M OPG samples used in this study was Among 85 samples,45 (52.9%) were male and40 (47.1%) were female; with the sex ratio of 1:1.3. The age range was from 19 to 55 years (mean age ± SD= 28.91±9.26). Among the 85 subjects,52.9% were males and 47.1% were Females.(Table 1)

Table 1 also contains data regarding the no.of roots in the Impacted Mandibular Third Molars considered for research,which revealed presence of single root in 11 (12.9%) of the observed cases and two roots were observed in 74 (87.1%) of cases.Out of the 85 IM3M 53 were Partially erupted and 32 were Completely impacted.

On clinical Evaluation of a patient ,He/she can be categoriesed as Symptomatic (54)and Asymptomatic(31), depending on the Chief Complaint and clinical response of the Patient .**Chart 1** shows the prevalence of various causes of Symptomatic Cases individually like Pericoronitis(72.2%),Pericoronal Abscess(0%),Restricted Mouth opening(1.9%) and Fetor Oris (0%)These clinical symptoms are also present in Combinations.

Then based on Radiological evaluation , In this study out of 85 impacted third molars, greater frequency of impacted third molars were found to be in a mesioangular 42 (49.4%), followed by 21 (24.7%) in vertical , 21(24.7%) horizontal,1 (1.2%) distoangular.There was no significant difference between the angulations of different groups(considering P<0.658)(Table 2)

Table 1:

Gender	Count	%	Number of Roots	Right		Left		Total	
Male	45	52.9		N	%	N	%	N	%
Female	40	47.1	1	6	14.0	5	11.9	11	12.9
Total	85	100.0	2	37	86.0	37	88.1	74	87.1
			Total	43	100.0	42	100.0	85	100.0

Chart 1:

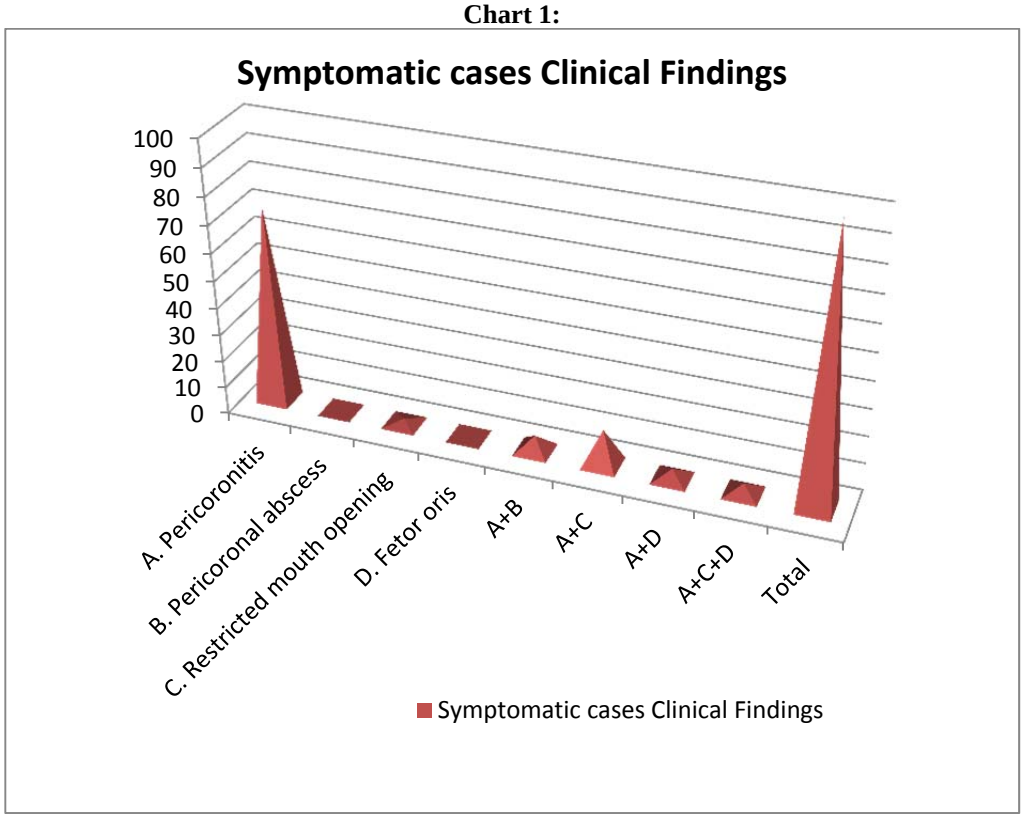

Table2:

Angulation of Impacted teeth							Level of Impaction						
Clinical Symptoms	Asymptomatic		Symptomatic		Total		Clinical Visibility	Partially erupted		Completely Impacted		Total	
	N	%	N	%	N	%		N	%	N	%	N	%
Mesioangular	13	41.9	29	53.7	42	49.4	Level-A	19	35.8	3	9.4	22	25.9
Disto angular	0	0.0	1	1.9	1	1.2	Level-B	25	47.2	12	37.5	37	43.5
Horizontal	9	29.0	12	22.2	21	24.7	Level-C	9	17.0	17	53.1	26	30.6
Vertical	9	29.0	12	22.2	21	24.7	Total	53	100.0	32	100.0	85	100.0
Total	31	100.0	54	100.0	85	100.0							
Chi square Test –Fisher's Exact Test Value-1.908,P-Value-0.658							Chi square Test –Fisher's Exact Test Value-17.244,P-Value<0.001						

Table 3:Distribution Based on Radiographic third molar Space Availability:

Available space	Clinical visibility if tooth						Chief Complaint					
	Partially erupted		Completely erupted		Total		Asymptomatic		Symptomatic		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Class-I	23	43.4	11	34.4	34	40.0	16	51.6	18	33.3	34	40.0
Class-II	29	54.7	20	62.5	49	57.6	15	48.4	34	63.0	49	57.6
Class-III	1	1.9	1	3.1	2	2.4	0	0.0	2	3.7	2	2.4
Total	53	100.0	32	100.0	85	100.0	31	100.0	54	100.0	85	100.0
Chi Square test -Value =14.353.P-Value <0.001												

Assessing the level of impaction using PELL and GREGORY classification showed that 22 (25.9%) impacted tooth was in position A, 37(43.5%) was in position B, and 26 (30.6%) was in position C.There was highly significant difference between the level of Impaction of Third molar in different groups considering P<0.001.(Table 2-Right side)

On Examination of the collected OPG's ,34(40.0%) impacted mandibular Third molar were in class1 reralition of which 33.3 % were symptomatic and 51.6% were

Table 4

Relation of IM3M	Chief Complaint						Clinical visibility of tooth				Impacted tooth					
	Asymptomatic		Symptomatic		Total		Partially erupted		Completely erupted		Right		Left		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Adjacent	12	38.7	28	52.8	40	47.6	33	62.3	7	22.6	17	40.5	23	54.8	40	47.6
Super imposed	14	45.2	13	24.5	27	32.1	12	22.6	15	48.4	16	38.1	11	26.2	27	32.1
Notching	1	3.2	7	13.2	8	9.5	2	3.8	6	19.4	3	7.1	5	11.9	8	9.5
Grooving	2	6.5	0	0.0	2	2.4	1	1.9	1	3.2	2	4.8	0	0.0	2	2.4
Perforation	2	6.5	5	9.4	7	8.3	5	9.4	2	6.5	4	9.5	3	7.1	7	8.3
None	0	.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	31	100.0	53	100.0	84	100.0	53	100.0	31	100.0	42	100.0	42	100.0	84	100.0
Chi square Test-Fisher's Exact Test=Pvalue-0.061																

Table5:

Effect on adjacent tooth	Chief Complaint						Clinical visibility if tooth						Impacted Tooth			
	Asymptomatic		Symptomatic		Total		Partially erupted		Completely erupted		Total		Right		Left	
	N	%	N	%	N	%	N	N	%	N	%	%	N	%	N	%
NP	22	71.0	27	50.0	49	57.6	29	24	55.8	25	59.5	54.7	20	62.5	49	57.6
P-DC	5	16.1	7	13.0	12	14.1	11	6	14.0	6	14.3	20.8	1	3.1	12	14.1
P-EXT	4	12.9	15	27.8	19	22.4	9	10	23.3	9	21.4	17.0	10	31.3	19	22.4
P-DC, EXT	0	0.0	5	9.3	5	5.9	4	3	7.0	2	4.8	7.5	1	3.1	5	5.9
Total	31	100.0	54	100.0	85	100.0	53	43	100.0	42	100.0	100.0	32	100.0	85	100.0
Chi-Square Test Fisher's Exact Test Value-6.145 P-Value -0.085							**Chi square Test** Fisher's Exact Test Value-14.353 P-Value-0.001						**Chi Square Test-Fisher's Test** Value-0.396 P-Value-0.998			

Asymptomatic,49 (57.6%) belonged to class2 relation of which 63.0% were symptomatic and 48.4% were Asymptomatic,while class 3 was found in 2 (2.4%) of the cases among which 3.7% were symptomatic. There was significant difference in the third molar space availability among different group was found when partially erupted and completed impacted tooth were compared considering P<0.001

On tracing the Inferior alveolar canal ,and identifying the relation between the canal and the root apices ,a total of 40(47.6%) was found to be in adjacent relation,27(32.1%) were superimposed. In 8(9.5%) the relation was notching ,in 2(2.4%) it was Grooving,and in 7(8.3%).There was no significant difference between the third molar roots and IAN relation in different groups (considering P<0.06) comparing asymptomatic with symptomatic group ,Partially erupted with Completely Impacted Category and right and left sided tooth.(Table4)

Radiological evaluation of the adjacent tooth to that of the impacted third molar ,reaveals any presence or absence of destructive effect on the adjacent tooth.Table 5 shows distribution of effect on adjacent tooth structure due to the impacted third molar which represents No destructive effects on adjacent tooth in 49(57.6%) of the samples,Presence of Decay in 12(14.1%) of case ,presence of external root ressorption in 19(22.4%) of cases,while both decay and External root resorption observed in 5(5.4%) of cases.There was no significant differences in the effect on adjacent tooth struction in symptomatic and asymptomatic group(P<0.085),and no significant difference comparing Right and left sided (P<0.998).But there was high significance when comparing the Partially erupted and Completely Impacted Groups(P<0.001).

DISCUSSION:

Orthopantomographs were taken for 65 subjects visiting Saveetha Dental College and Hospitals who consented to participate in our study. Only those subjects who conformed to the inclusion and exclusion criteria outlined previously were selected for the study. The normal time of eruption of third molars are variable, starting at the age of 16 years.[25] The patients included in our study were consecutive individuals in the age group of 20–35 years (mean 28.91). This was consistent with other studies where the subjects were in the same age group [26-29].The subjects were clinically examined and their OPG's were taken. Evaluation was done as per guidelines mentioned in the materials and methods. The parameters sought were prevalence of impacted third molars with or without clinical symptoms and clinical visibility, no.of roots ,angulations, level of eruptions, mesiodistal width of impacted third molar and retromolar space

available,relation to the Inferior Alveolar canal,and effect on the adjacent tooth structure. The OPG' were also used for evaluating the agenesis of third molars.

In our study, the frequency of impacted third molars showed a predilection for males over females which was not consistent with a previous study [25,26,30]w Haidar and Shalhoub[40]evaluated 1000 orthopantomograms (OPGs) and reported an incidence of 32.3% for third molar impaction with no sex predilection.

The mesiodistal space available for third molars is as same as or larger than mesiodistal width of the crown then, the crown has more chances to erupt.[31] In the present study the mean mesiodistal crown width of right and left side of the mandible is 13.17 mm (1.07) and 13.16 mm (1.18). the corresponding average retromolar space of right and left mandible is 11.8 mm (SD = 2.96) and 12.16 (SD = 2.86) respectively.

The most significant radiological sign noticed in our study was the diversion of the mandibular canal & the least associated sign was found to be grooving. Our study was in consistent with the study conducted by Rood & Carrio.[32,33]

The current study is in agreement with those of Quek et al,[34] Kramer and Williams,[35] and Moris and Jerman[36] regarding the most common angulation in the mandible, which was the mesioangular (41.9%). However, the findings are in contrast to those of Hugoson and Kugelberg,[37] who found the vertical angulation to be the most common. This could be due to the fact that a different method of classification of angulation was used in this study.

Evaluating incidence, position, depth and measurements of impacted teeth in a population helps us to compare the patterns of impacted teeth in other regions and sub-populations of the world.

Most third molars were noticed in level B(43.5%), followed by level C(30.6%)and level A(25.9%). In all impactions the mesiodistal width of the tooth was more than the retromolar space, there by accounting for the impactions.

As the presence of Partially impacted Mandibular molars are higher than the completely impacted molars,it was found that_mandibular third molars are in Class 2 relation,followed by –in class 1 relation and – in class 3 relation.Results of present study are in accordance with that of Susarla and Dodson[38].Results were not in agreement with that of Jerjes et al [39]as they suggested maximum number of IM3M in class 1 relation..the measurement of mesiodistal space ,measured from the panaromic radiograph served to be an important variable in prediction of the eruption.Abortive eruption occurs due to lack of space also. In the present study, 12.9% one, 87.1% two and 0% had three roots ,this was similar to that reported by Tammisalo.[41] However, the findings of the present study are very much dissimilar with 22% one 67% two and 11% more than two roots reported byWenzel.[42] The disparity among the number of roots for third molars could be attributed to the racial variation, sample size, and methodology.The presence of destructive effect on adjacent tooth structure was noted in 42.4% of the cases of which dental caries was prevalent in 14.0% of right and 14.3% of left side,external root resorption in 23.3% of right and 21.4% of left side impacted tooth,presence of both in 7.0% in right and 4.8%in left side.

On comparing this study with other regional studies it was evident that there was no universal consensus on incidence or patterns of impactions. These differences may be attributed to inadequate International standardization of evaluation criteria and to the difference in evaluation tools. There is plenty of scope to do standardized global multicentric studies with uniform guidelines and larger number of subjects. This may help us to understand similarities and differences in the patterns of impaction on global level.

CONCLUSION:

Thereby, future studies are required to evaluate the etiology behind this relatively high frequency of third molar impaction especially in the India. The present study, like most of the similar previous works about third molar impaction, used a hospital based sample, which lacks randomization. More precise studies are necessary to evaluate the impaction of third molars in a randomized sample representative of Indian population as they are required to evaluate the pattern of third molars impaction in India. Thus this study has hopefully fulfilled the purpose of creating evidence based report of preoperative evaluation of Impacted mandibular third molar thus minimizing the complications during surgical extraction.

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