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EFFECTS OF ERUPTION LEVEL AND ANGULATION OF THIRD MOLARS ON CARIES FORMATION IN ADJACENT TOOTH BY PANAROMIC RADIOGRAPHS.

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ABSTRACT:

The partially erupted maxillary third molars with an eruption level of position B caused caries more frequently both in themselves and in the adjacent teeth. Similarly, the angulation of the partially erupted maxillary third molars was also effective on caries formation.If your wisdom teeth have enough space, and if they grow in straight, you might not ever feel pain. However, if your wisdom teeth erupt and there isn't enough room for them in your mouth, they typically cause intense pain, inflammation, and irritation.This study is aimed to determine the prevalence of impacted third molars and to investigate the effects of their eruption level and angulation on caries formation in the distal of the adjacent tooth.This cross-sectional study was conducted on panoramic radiographs of 38481 patients who were admitted to the Trakya University, Faculty of Dentistry. The panoramic radiographs of 7998 patients with at least one impacted third molar were included. Third molars were classified according to Winter's classification and Pell and Gregory's classification. The frequency of caries in partially impacted third molars and adjacent second molars was determined. The chi-square tests were used to determine potential associations between the third molars' level of eruption, angulation, and caries development.

Keywords: Third molars , eruption level , angulation , caries , adjacent tooth

1.INTRODUCTION:

Impacted teeth are defined as those teeth that remain unerupted in the dental arch due to various systemic and local reasons within the expected time (1) . The most frequently impacted teeth are undoubtedly the third molars and the prevalence ranges. Furthermore, third molars (2), account for 98% (3) of all impacted teeth. The major etiologic factors of third molar impaction (4) are the late maturation and lack of space. Additionally, third molars may remain impacted

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or semi-impacted due to reasons such as limited skeletal growth, tooth shape or position anomalies, increased regional bone density, infection, cysts, specific systemic diseases, and syndromes.Although impacted third molars may remain symptom free indefinitely, they could give cause for various symptoms and pathologies, such as pericoronitis, pain, swelling, distal caries, bone loss, root resorption of adjacent teeth, odontogenic cysts and tumors.The depth or level of maxillary and mandibular third molars can be classified using the Pell and Gregory classification system, where the impacted teeth are assessed according to their relationship to the occlusal surface of the adjacent second molar.(5)

Every impacted third molar does not cause symptoms and pathological events. However, others can cause severe complications such as infection, atypical facial pain that can be confused with temporomandibular joint complaints, cystic lesions, and neoplasm (6-7). Besides, impacted teeth are often associated with pericoronitis, periodontitis, and detrimental effects on adjacent teeth such as bone resorption or caries (8). Prophylactic extraction of asymptomatic impacted molars is controversial and clinical decision making regarding extraction should be based on the benefits and harms for the patient. Furthermore, the National Institute of Clinical Excellence guidelines advises against prophylactic extraction of third molars.(9)

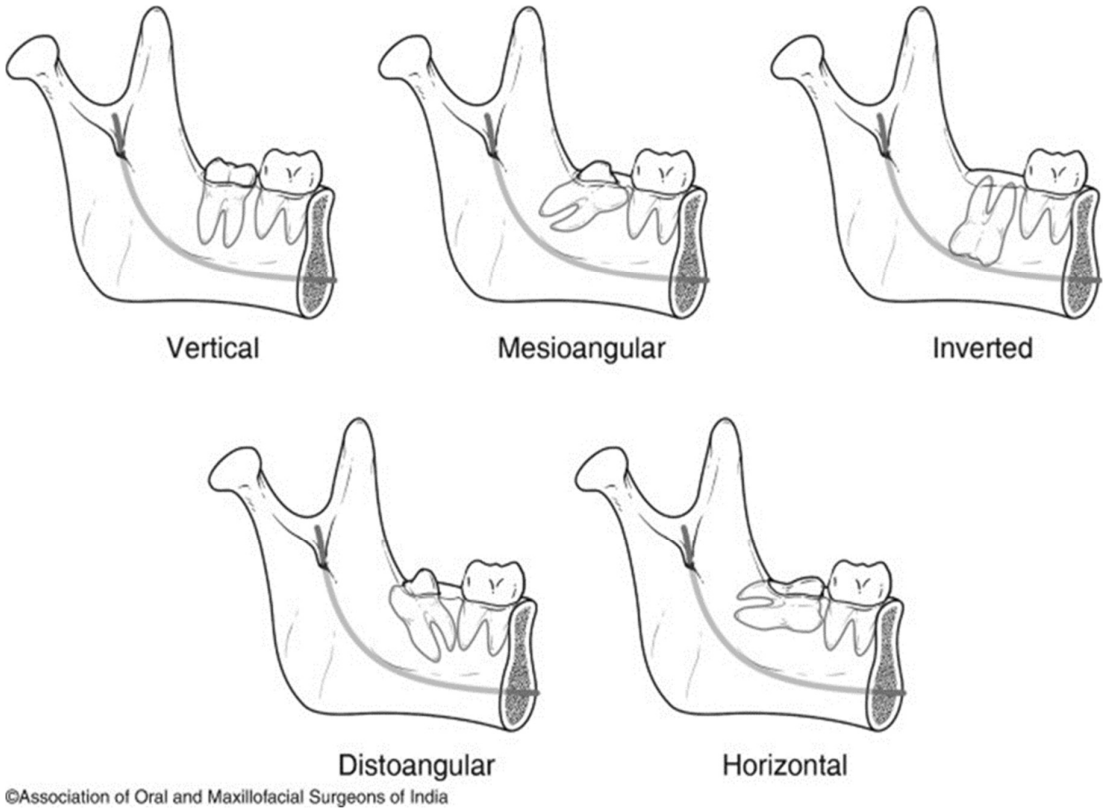
As a result of the relationship of the third molar with the second molar, the distal root surface of the second molar can be exposed to the oral environment (10). This relationship can be affected by the position and angulation of the third molars. Especially, partially erupted mesioangularly or horizontally positioned third molars come into contact with the distal cervical region of the second molar and increase the risk of caries development (11) . The aim of this study is to determine the effects of eruption level and angulation of impacted third molars on caries formation in adjacent tooth by panoramic radiographs.(12)

2.MATERIALS AND METHODS:

This cross-sectional study was planned on routinely taken panoramic radiographs of 1000 patients who were admitted to Dental university in Chennai between 2017 and 2021. The files of 38481 patients aged 25 and older were examined and panoramic radiographic images of 7998 patients with at least one impacted third molar who met the inclusion criteria were included. The inclusion criterion was the eruption level and angulation of third molars on caries formation in adjacent tooth. Patients with extracted third molars or the absence of adjacent second molars and who had crowns or restorations on these teeth were excluded from the study. Radiographs with superposed interdental spaces or insufficient quality for evaluation were also excluded from the study. The radiographs that were examined in this study were taken with the same panoramic x-ray device (Pax-Flex 3D Vatech, Hwaseg Chennai, India) at Chennai University, and none of the radiographs were exposed especially for this study.(13-15)

The radiographic images were evaluated by the same observer on the computer monitor with subdued ambient lighting and third molars were classified according to the eruption status (fully erupted, partially erupted, or unerupted), angulation based on Winter's classification seen in (Figure.1), and the level of impaction according to Pell and Gregory's classification seen in (Figure.2). In the Winter classification, the angulation of the impacted tooth is determined by measuring the angle between the long axis of the tooth and the occlusal plane on panoramic radiography.(16-17) According to this classification, third molars were grouped as distoangular (>90°), vertical (90°- 61°), mesioangular (60°- 31°), horizontal (30°- 0°), inverted (0°), and others. According to the Pell and Gregory classification, third molars were defined according to their relationship with the occlusal plane of the second molar. Accordingly, three positions are specified. Position A: the highest part of the impacted third molar is at or above the occlusal plane. Position B: the highest part of the impacted third molar is below the occlusal plane but above the cementoenamel junction (CEJ) of the second molar. Position C: The highest part of the impacted third molar is below the CEJ of the second molar. (18-20) The classification of the pathologic conditions was determined on panoramic radiographs and classified as follows:

1) distal caries on the second molar; 2) mesial caries on impacted third molar; 3) caries on both third and second molars; 4) no caries.



(Figure.2)

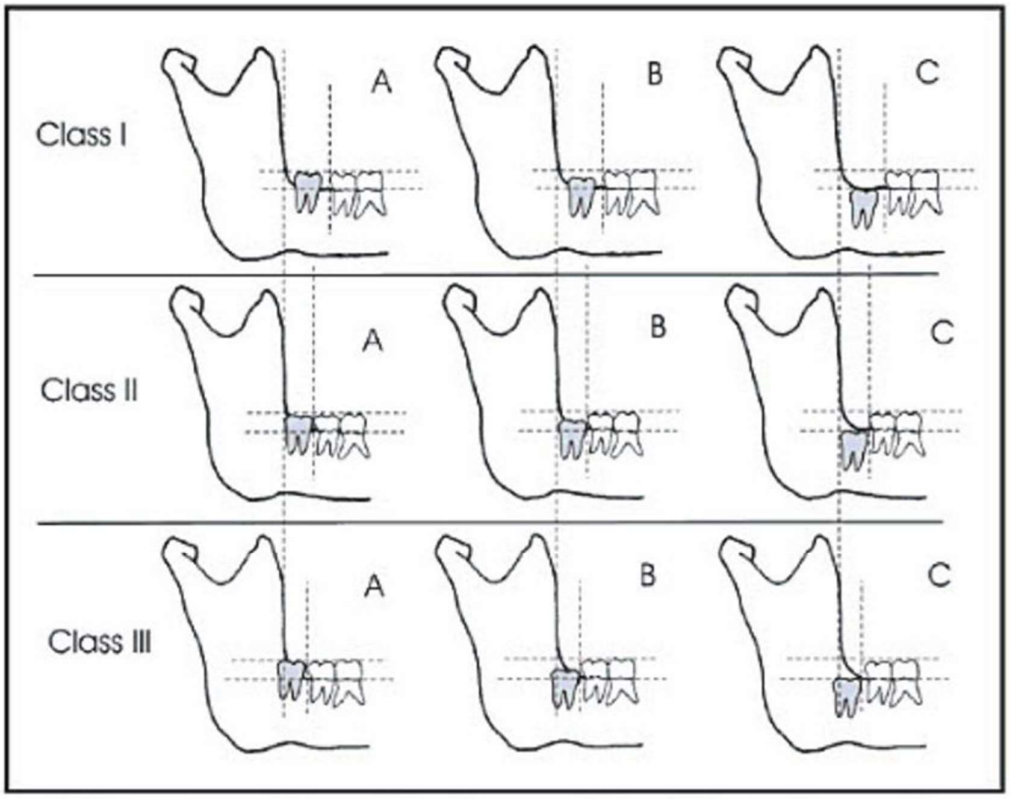


Figure.2

21) Statistical analysis was performed with IBM SPSS Statistics for Windows, Version 23.0. Descriptive statistics such as prevalence, frequency distributions, and percentages were (22) calculated for the gender, and classification of third molars' position, and angulation. The chi-square tests were used to determine potential associations between the third molars' position, angulation, and caries development. Any *P* value less than 0.05 was considered significant.(23)

3.RESULTS:

Of the 38481 patients aged 25 years and older included in the study, 8828 had at least one impacted third molar tooth. The prevalence of impaction rate was 23%. Since the quality of panoramic radiographs of 830 patients was not suiTable for radiological evaluation, the study group consisted of radiographs of 7998 patients. Distributions of impacted third molars were given in Table 1. 55.3% of the impacted third molars were observed in females and 44.7% in males. There was a significant difference between the genders (p=0.00) and impacted third molars were observed more frequently in females. When the locations of the impacted third

molars were examined, a significant difference was observed between the jaws (p=0.012). However, no statistically significant difference was found between the right and left sides.

Jaw	Tooth Number	N / %	P	P
Maxilla	18	3841 / 48%	>0.05	**0.012***
	28	3807 / 47.6%		
Mandible	38	5361 / 67%	>0.05	
	48	5322 / 66.5%		

Chi-squire test, *p<0.05

Figure.3 shows the Distributions of impacted molars.

Since 98.4% of impacted third molars in the maxilla and 70% in the mandible are fully unerupted, their effects on the adjacent tooth were not evaluated. Of the fully unerupted third molars in the maxilla, 56.6% were in vertical, 27.2% distoangular, 11.1% mesioangular, 1.7% horizontal, and 0.3% inverted position. On the other hand, 58.2% of the fully impacted third molars in the mandible were in mesioangular, 16.7% horizontal, 16.3% vertical, 6.6% distoangular, and 0.01% inverted position, and there was a significant difference between jaws and fully unerupted third molars' angulations (p=0.000). While most of the fully unerupted maxillary third molars were in the vertical position, the mesioangular position was more common in the mandibular third molars.

The level of impaction and angulations of the partially erupted third molars were shown in Figure.4. A statistically significant relationship between the level of impaction and angulations of the partially erupted third molars was observed in both the maxilla and mandible. Partially erupted third molars were mostly in vertical status and position A in both maxilla and mandible.

Jaws	Angulation	Position				
		Position A	Position B	Position C	Total	P
Maxilla	Mesioangular	2(1.6%)	16 (13.1%)	-	18 (14.8%)	**0.000***
	Distoangular	3(2.5%)	11 (9%)	2 (1.6%)	16 (13.1%)	
	Horizontal	4(3.3%)	-	-	4 (3.3%)	
	Vertical	40(32.8%)	32 (26.2%)	12 (9.8%)	84 (68.9%)	
	Total	49(40.2%)	59 (48.4%)	14(11.4%)		**0.000***
	P				**0.000***	
Mandible	Mesioangular	557(17.9%)	264(8.5%)	19(0.6%)	840 (27%)	**0.000***
	Distoangular	114(3.7%)	61(2%)	9(0.3%)	184(5.9%)	
	Horizontal	378(12.2%)	191(6.1%)	-	569(18.3%)	
	Vertical	1036(33.3%)	466(15%)	8(0.3%)	1510(48.6%)	
	Others	7(0.2%)	-		7(0.2%)	**0.000***
	Total	2092(67.3%)	982(31.6)	(1.2%)		
	P				**0.000***	

Chi-squire test, *p<0.05

Figure.4 shows Distributions of the positions and angulations of the partially erupted third molars.

Of the partially erupted maxillary third molars, 65.6% were associated with caries either in the impacted third molar or in the adjacent tooth. Caries was present in 33.6% of the partially erupted maxillary third molars. 19.7% of the partially erupted maxillary third molars have caused distal caries in the adjacent tooth. On the other hand, 12.3% of partially erupted maxillary third molars have caused caries both in themselves and in the adjacent teeth. When the relationship between the degree of eruption of the partially erupted maxillary third molars and caries was examined, a significant relationship was observed (Figure.5). The partially erupted maxillary third molars with an eruption level of position B caused caries more frequently both in themselves and in the adjacent teeth. Similarly, the angulation of the partially erupted maxillary third molars was also effective on caries formation. The partially erupted maxillary third molars, which most frequently cause caries in the adjacent tooth, were vertically located followed by the mesioangular position. The presence of caries in the vertically partially erupted maxillary third molars with eruption level of position A was statistically significantly higher than in other positions (p=0.040).

Jaws	Caries Development					
	Distal caries on 2th molars	Mesial caries on 3th molars	Caries on both	No Caries	Total	*P*
Maxilla						
Mesioangular	9(7.4%)	9(7.4%)			**18(14.8%)**	**0.000***
Distoangular	-	3(2.5%)	-	13(10.7%)	**16**	
Horizontal	4(3.3%)	-	-	-	**4(3.3%)**	
Vertical	11(9%)	29(23.8%)	15(12.3%)	29(23.8%)	**84(68.9%)**	
Total	**24(19.7%)**	**41(33.6%)**	**15(12.3%)**	**42(34.4%)**	**122**	
Position A	4(3.3%)	22(18%)	15(12.3%)	8(6.6%)	**49(40.2%)**	**0.000***
Position B	20(16.4%)	19(15.6%)	-	20(16.4%)	**59(48.4%)**	
Position C	-	-	-	14(11.5%)	**14(11.5%)**	
Total	**24(19.7%)**	**41(33.6%)**	**15(12.3%)**	**42(34.4%)**	**122**	
Mandible						
Mesioangular	283(9.2%)	23(0.7%)	160(5.2%)	355(26.7%)	**821(26.7%)**	**0.000***
Distoangular	15(0.5%)	-	-	169(5.5%)	**184(6%)**	
Horizontal	141(4.6%)	16(0.5%)	85(2.8%)	319(10.4%)	**1501(48.8%)**	
Vertical	142(4.6%)	92(3%)	171(5.6%)	1096(35.7%)	**561(18.2%)**	
Others	-	-	-	7(0.2%)	**7(0.2%)**	
Total	**581(18.9%)**	**131(4.3%)**	**416(13.5%)**	**1946(63.3%)**	**3074**	
Position A	403(13.1%)	97(3.2%)	299(97%)	1272(41.4%)	**2071(67.4%**	**0.000***
Position B	178(5.8%)	34(1.1%)	117(3.8%)	638(20.8)	**967(31.5%)**	
Position C	-	-	-	36(1.2%)	**36(1.2%)**	
Total	**581(18.9%)**	**131(4.3%)**	**416(13.5%)**	**1946(63.3%)**	**3074**	

Figure.5 shows the The relationship between the degree eruption level and angulation of partially erupted third molars with caries formation.

DISCUSSION:

According to Pell and Gregory's classification, the most reported eruption level of partially erupted third molars in the present study was position B in the maxilla, position A in the mandible. On the other hand, the B level was the most common level of impaction in both jaws. However, these studies did not classify impacted third molars such as fully impacted or partially erupted. Moreover, the most common eruption level in the mandible is position A.(26)

Considering the results of this study, the presence of distal caries in the second molar is 19.7% for the mandible, 18.7% for maxilla, consistent with the rate of 14.74% and 21.5% by . However, the reported rate in the present study was higher than 12.6% and 2.5% . Furthermore, caries was present in 33.6% of the partially erupted maxillary and 4.2% in mandibular third molars. A similar rate of 5.3% was reported for mandibular third molars. Both the level of impaction and angulations of partially impacted third molars were risk factors for distal cervical caries on adjacent teeth. Vertically located maxillary impacted third molars with an eruption level of position B were related with distal caries on second molars while mesioangularly located mandibular molars with position A mostly related with caries. There were studies in the literature which supported the high risk of distal caries on second molars associated with mesioangularly or horizontally located mandibular third molars (29-31). However, the number of studies on maxillary impacted third molars was quite limited.The caries incidence was higher in vertical angulation of the tooth numbered 28. This study supported the findings of the present study. The main reason for the development of cervical caries on the adjacent tooth of the mesioangularly positioned mandibular molar was that they cause an unaccessible contact area between two teeth and consequently proper cleaning becomes impossible. On the other hand, even vertically positioned maxillary third molars can cause cavities due to the difficulty of oral hygiene procedures and the inaccessibility of the toothbrush in the maxilla. Therefore, all third molars in abnormal positions should be followed regularly, and extraction should be considered as a treatment option if necessary to avoid complications such as caries.(27)

Within the limitations of this study, demineralization and initial enamel caries in third molars and adjacent teeth could not be evaluated. Another limitation of the present study was that only panoramic radiographs were used(27). The most reliable way for caries diagnosis was the combination of both clinical and radiographic examination. Even though, bite-wing radiographs are the golden standard for approximal evaluation, routinely taken panoramic radiographs can also be used. In addition, a larger sample group can be reached by examining routinely taken panoramic radiographs, and more reliable results can be obtained with a larger sample. Besides, patients were prevented from being exposed to extra doses of radiation. However, detailed evaluations can be made and more accurate estimates of the risk of complications can de determined by using cone beam computerized tomography (CBCT) scans. Our team has extensive knowledge and research experience that has translate into high quality publications(28-37)

4.CONCLUSION:

The pattern of partially erupted third molar impaction was characterized by a high prevalence rate of level A impaction with the vertical position in both jaws. Partially erupted and vertically placed maxillary third molars in the level of position A caused more caries in the adjacent tooth. On the other hand, mesioangularly located partially erupted mandibular third molars were associated with more caries in the adjacent tooth.(24)

In conclusion, the angulation and eruption level of partially erupted third molars should be taken into consideration in terms of complications such as caries. The prophylactic removal of vertically and mesioangularly located third molars, especially with an eruption level of position A can be suggested.(25)

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