

# Relationship of Oral Pathologies Associated with Second Molars to the Patterns of Adjacent Impacted Third Molar

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## ABSTRACT

**Objective:** To assess the relationship of oral pathologies associated with second molars to the patterns of adjacent impacted third molar.

**Methodology:** A cross sectional descriptive study was conducted on 385 Orthopantomograms (OPG) of patients. The study was conducted in the Institute of Dentistry, CMH Lahore Medical College, Lahore, Sharif Medical and Dental College (SMDC) and Services Institute of Medical Sciences (SIMS) over a period of three months from December 2020 to February 2021. The Pell and Gregory classification was used for depth of third molar impaction and ramus relationship of mandibular third molars. Winter's classification was used for classifying the angle of impaction.

**Results:** The association between presence of caries ( $p \leq 0.001$ ) and external resorption ( $p \leq 0.001$ ) in second mandibular molar with depth of impaction of adjacent an impacted third molar, ramus relationship of third molar with presence of external root resorption in second molar ( $p \leq 0.001$ ) and presence of caries ( $p = 0.005$ ), periapical radiolucencies ( $p = 0.009$ ) and external root resorption ( $p \leq 0.001$ ) in second molar with the angle of impacted third molar were significant. The association of presence of caries, pericoronal, periapical radiolucencies and external root resorption in the maxillary second molars with the depth and angle of adjacent impacted third molars was not significant.

**Conclusion:** The carious lesions were the highest where the third molar had class A depth of impaction while the maximum external resorption was seen where the third molar had class C depth of impaction. Second mandibular molars adjacent to impacted third molars in class 2 ramus relationship had the most external root resorption. It was seen that second molars adjacent to the impacted third molars with mesioangular impactions had the highest percentage of caries and periapical radiolucencies while those adjacent to third molars with horizontal angle of impaction showed the maximum external root resorption.

**Keywords:** Second molars, impacted third molars, pericoronal radiolucency, periapical radiolucency, external root resorption, caries

## INTRODUCTION

Tooth impaction is a pathogenic condition where a tooth can or would not erupt into correct operational location until intervention is provided. Numerous local and systemic variables have a role in the aetiology of permanent tooth impaction. Systemic variables which may promote permanent tooth impaction include cleidocranial dysplasia, Down syndrome, endocrine impairments, febrile illnesses, and radiotherapy<sup>1</sup>. Extended deciduous tooth retaining, malposed tooth germs, arch-length insufficiency, supernumerary teeth, odontogenic tumours, aberrant eruption route, and cleft lip and palate are the most common local variables<sup>2</sup>. The most commonly impacted tooth in oral cavity is the third molar. The frequency of impacted third molar varies between 16.7% and 68.6%<sup>3</sup>. Impaction has been classified using a variety of criteria, including the level of impaction, the third molar angulations, and the relation to the anterior borders of the mandible's ramus<sup>4</sup>.

Third molars that have been impacted were linked to varied levels of destruction to the second molars. Distal cervical caries, root erosion of the second molar, periodontal issues, odontogenic cysts, and other consequences are also conceivable. The position and alignment of an impacted third molar with in bone determine whether it will damage the second molar<sup>5</sup>. According to an analysis done by Kumar, position B impactions (26.8%), horizontal plane (14.7%), disto-angular (12.10%), near vertical (14.5%), and mesioangular (16.4%) in adjoining mandibular second molars have been associated significantly with tooth decay (32.20 % and 33.90 %, in both), and periodontal pockets have been seen greater with location B impactions (26.8%), horizontal plane (14.7%), disto-angular (12.10%), vertical (14.5%), and mesioangular.(16.4%) The most degree of root resorption was observed in horizontal impaction (17.30 %) with positioning c type (12.30 % ). Tooth decay (19.9%) > periodontal pockets (15.2%) > root resorption (8.5 % ) were the pathologies linked with second molar attributed to

impacted third molar in that order<sup>2</sup>. In contrast to certain other characteristics such as higher vulnerability to dental caries in generally, McArdle and Renton established that the location of lower third molar is a more important predictor for distal caries progression in lower second molar<sup>6</sup>. In terms of the angulation of the impacted molar, most researchers concur that a mesioangular inclination is strongly linked to the development of caries, but vertical, distoangular, or aberrant impactions are uncommon to create this condition. The current studies, however, suggests that horizontal angulation may possibly be a significant risk factor<sup>7</sup>. Retained asymptomatic lower third molar is often associated with odontogenic cysts (66.8). Dentigerous cysts (60%) as well as odontogenic keratocysts (40%) have been the most common pathologies (26.3 %). Males have been the ones who were most significantly affected (63.3 %)<sup>8</sup>. The aim of the study to assess the relationship of oral pathologies associated with second molars to the patterns of adjacent impacted third molar.

## METHODOLOGY

A cross sectional descriptive study was conducted on 385 Orthopantomograms (OPG) of patients. The sample size was calculated keeping the confidence level 95%, anticipated population proportion 0.462, absolute precision 0.05<sup>9</sup> and was determined to be 383. The study was conducted in the Institute of Dentistry, CMH Lahore Medical College, Lahore, Sharif Medical and Dental College (SMDC) and Services Institute of Medical Sciences (SIMS) over a period of three months from December 2020 to February 2021. The Sampling technique used was convenience sampling. Ethical approval was obtained from the Sharif Medical Research Centre (SMRC) before the commencement of the study. Patients above the age of 21 years irrespective of their gender were a part of the study. Patients without impacted mandibular and maxillary third molars and

second molars were excluded from the study. Orthopantomograms (OPG) were obtained from the radiology department of Sharif Medical and Dental College (SMDC) and Services Institute of Medical Sciences (SIMS).<sup>10</sup> The Pell and Gregory classification was used for depth of third molar impaction and ramus relationship of mandibular third molars<sup>4</sup>. The OPGs were evaluated for the Mandibular and Maxillary Third molar impactions. The impacted molars were then analyzed with respect to the angle, depth of impaction and associated radiolucencies in case of mandibular molars and maxillary molars. The mandibular molars were also analyzed with respect to ramus relationship. Winter's classification was used for classifying the angle of impaction<sup>10</sup>. A standard criteria was used for evaluating the associated radiolucencies<sup>9</sup>. Statistical analysis was done using SPSS 23. Numeric data was presented as mean and standard deviation. Nominal data was presented as frequency and percentage. P value less than equal to 0.05 was taken significant. Chi square and fisher exact tests were used to find the association of radiolucencies (caries, pericoronal radiolucency, periapical radiolucencies and external root

resorption) associated with mandibular and maxillary second molars with the patterns of impaction of third molars (angle of impaction, depth of impaction and ramus relationship).

**RESULTS**

A Cross sectional study was conducted and a total of 385 Orthopantomograms were observed. The mean age of the patients was 32.71±9.198 years with 49.9% females and 50.1% males.

Table 1 shows The association between presence of caries (p=≤0.001) and external resorption (p=≤0.001) in second mandibular molar with depth of impaction of adjacent an impacted third molar, ramus relationship of third molar with presence of external root resorption in second molar (p=≤0.001) and presence of caries (p=0.005), periapical radiolucencies (p=0.009) and external root resorption (p=≤0.001) in second molar with the angle of impacted third molar were significant as shown in table 1.

Table 1: Association of oral pathologies associated with mandibular second molar adjacent to an impacted third molar.

	Classification	Caries		Periapical		Pericoronal		External resorption	
		n (%)	P value <sup>a</sup>	n (%)	P value <sup>a</sup>	n (%)	P value <sup>b</sup>	n (%)	P value <sup>a</sup>
Depth of Impaction	Class A	70(11.6%)	≤0.001	207 (34.2%)	0.945	1(0.2%)	0.585	3(0.5%)	≤0.001
	Class B	37(6.1%)		176 (29.1%)		1(0.2%)		3(0.5%)	
	Class C	9(1.5%)		83 (13.7%)		1(0.2%)		12(2%)	
Ramus relationship	Class 1	25 (4.1%)	0.234	76 (12.6%)	0.5842	2 (0.3%)	0.105	2 (0.3%)	P value <sup>b</sup>
	Class 2	86(14.2%)		372 (61.5%)		1 (0.2%)		12 (2%)	
	Class 3	5 (0.8%)		18 (3%)		0 (0%)		4 (0.7%)	
Angle of impaction	Vertical	21 (3.5%)	0.005	103(17%)	0.009	3(0.5%)	0.057	1 (0.2%)	≤0.001
	Horizontal	37 (6.1%)		113 (18.7%)		0 (0%)		13 (2.1%)	
	Mesioangular	58 (9.6%)		227 (37.5%)		0 (0%)		4 (0.7%)	
	Distoangular	0 (0%)		22 (3.6%)		0 (0%)		0 (0%)	
	Buccolingual	0 (0%)		1 (0.2%)		0 (0%)		0 (0%)	

<sup>a</sup> Chi square test , <sup>b</sup> Fisher Exact test

Table 2 shows that the greatest percentage of caries, periapical radiolucencies and pericoronal radiolucencies in the maxillary second molar was seen in the ones adjacent to third molar with Class C depth of impaction. The highest percentage of caries were seen in vertical impactions. Periapical and pericoronal radiolucencies were seen to be the most prevalent in distoangular impactions while external root resorption in the second molars adjacent to the impacted third molar in mesioangular impaction as shown in table 2.

Table 2: Association of oral pathologies associated with maxillary second molar adjacent to an impacted third molar.

	Classification	Caries		Periapical		Pericoronal		External resorption	
		n (%)	P value <sup>b</sup>	n (%)	P value <sup>a</sup>	n (%)	P value <sup>b</sup>	n (%)	P value <sup>b</sup>
Depth of Impaction	Class A	0 (0%)	0.477	0 (0%)	0.306	0 (0%)	1.000	0 (0%)	0.196
	Class B	4 (1.7%)		52 (22.1%)		0 (0%)		2 (0.9%)	
	Class C	6 (2.6%)		140 (59.6%)		1 (0.4%)		1 (0.4%)	
Angle of impaction	Vertical	6(2.6%)	0.056	37 (15.7%)	0.244	0 (0%)	1.000	0(0%)	0.335
	Mesioangular	0(0%)		45 (19.1%)		0(0%)		2(0.9%)	
	Distoangular	4(1.7%)		104 (44.3%)		1(0.4%)		1(0.4%)	
	Horizontal	0(0%)		1 (0.4%)		0(0%)		0(0%)	
	Buccolingual	0(0%)		5 (2.1%)		0(0%)		0(0%)	

<sup>a</sup> Chi square test , <sup>b</sup> Fisher Exact test

**DISCUSSION**

The very last teeth to emerge with in oral cavity are indeed the third molars. Root development begins at the age of 15, and eruptions commences around the age of 20. The eruption sequence and impaction condition are thought to be influenced by racial differences in facial growth, jaw size, and tooth size. The third molar is usually the most impacted oral component due to the delayed growth of these roots, a deficiency of space, or a physical hindrance in the eruption path. Pericoronitis, carious lesions, odontogenic lesions or tumors, periodontitis, and external root resorption (ERR) of nearby teeth can all be caused by this impaction<sup>11</sup>. In dental practice, a partially erupted third lower molar is a regular occurrence. Since this molar can develop pathologies in the surrounding second molar. The long-term implications of unerupted third molars on neighboring teeth are still unknown. However, current evidence suggests that keeping third molars is linked to a higher risk of second molar illness<sup>12</sup>. The existence of a

noticeable third molar has been connected with double the probability of periodontal probing depth of 5 mm more than on the adjoining second molar, according to Elter et al., who had used information from 5,831 adults (18-34 years old) in the US Third National Health and Nutrition Examination Research study. In the Dental Atherosclerosis Risk in Communities Study, the existence of wisdom teeth was linked to a 50% greater risk of periodontal probing depth of 5 mm more than on neighboring second molars in 52- to 74-year-olds<sup>13</sup>. According to a study done by Nunn ME, the distal caries was more common in second molars next to erupted third molars than in second molars closest to missing third molars. Distal bone resorption 20% and distal probing depth > 4 mm were much more common in second molars next to tissue impacted wisdom molars. Distal bone loss of 20% was more common in second molars close to bone impacted wisdom molars<sup>14</sup>.

According to our study, the highest percentage of carious lesions (11.6%), periapical radiolucencies (34.2%), pericoronal

radiolucencies (0.2%) in the second mandibular molars were seen where the third molar had class depth of impaction while the greatest percentage of external resorption (2%) was seen where the third molar had class C depth of impaction. Second mandibular molars adjacent to impacted third molars in class 2 ramus relationship had the most carious lesions (14.2%), periapical radiolucencies (61.5%) and external root resorption (2%). The highest percentage of pericoronal radiolucencies (0.3%) in second molars were found when the adjacent impacted third molar was in class 1 ramus relationship. It was seen that second molars adjacent to the impacted third molars with mesioangular impactions had the highest percentage of caries (9.6%) and periapical radiolucencies (37.5%) while those adjacent to third molars with horizontal angle of impaction showed the maximum external root resorption (2.1%).

A lot of studies have suggested the link between the type of 3<sup>rd</sup> molar impaction with pathologies associated with 3<sup>rd</sup> molar and adjacent 2<sup>nd</sup> molars. According to a study by Nazi A, the majority of silent third molars had a horizontal alignment, suggesting that even if the depth and space from neighboring second molars are sufficient, such horizontal angulated impacted molars may stay disease-free. Prevents cavities was most commonly found in patients who had both position A depth and pericoronitis. Patients having positions A and B were more likely to develop pericoronitis. One of most typical form of impaction were mesioangular, with such a depth of position A and a ramus relationship of class II. A most frequent pathology linked with impacted third molars is tooth decay. Mesioangular, position A, class I molar were more commonly connected with it. Distoangular, position A or B, class II molars were more typically related with pericoronitis. The cumulative incidence of cysts and tumours related to impacted third molars were lower<sup>15</sup>. Wang concluded that the horizontal and mesial impaction of lower third molar tooth caused ERR in the second molar<sup>16</sup>.

According to our study, the greatest percentage of caries (2.6%), periapical radiolucencies (59.6%) and pericoronal radiolucencies in the maxillary second molar was seen in the ones adjacent to third molar with Class C depth of impaction. The highest percentage of caries (2.6%) were seen in vertical impactions. Periapical and pericoronal radiolucencies (44.3% and 0.4% respectively) were seen to be the most prevalent in distoangular impactions while external root resorption in the second molars (0.9%) adjacent to the impacted third molar in mesioangular impaction.

Chu et al<sup>17</sup>. identified 13 (0.4 %) occurrences of resorption among approximately 3000 impacted wisdom teeth in previous studies of a Hong Kong Chinese community. It also differs from the observations of van Der Linden et al<sup>18</sup>., who found just 0.9 % frequency in 2872 impacted third molars. In contrast, Ahlqvist et al documented just one case of second molar resorption inside a sample of 121 impacted wisdom teeth, and Sewerin and von Wowern<sup>19</sup> recorded nearly zero second molar impaction. Literature showed close association between the type of impaction of third molar and pathologies cause by it as according to Falci et al second molar distal caries is much more common in class II, following the class I and class III impacted third molars<sup>7</sup>. In another analysis by Haddad Z, class I impacted third molars had the highest link to second molar distal caries (62.6%), following the class II (37.4%), and class III (0%)<sup>20</sup>.

**Limitation:** A histopathological analysis of the lesions appearing on the radiograph could have helped classify the oral pathological lesions in a more elaborate fashion.

## CONCLUSION

The carious lesions were the highest where the third molar had class A depth of impaction while the maximum external resorption was seen where the third molar had class C depth of impaction.

Second mandibular molars adjacent to impacted third molars in class 2 ramus relationship had the most external root resorption. It was seen that second molars adjacent to the impacted third molars with mesioangular impactions had the highest percentage of caries and periapical radiolucencies while those adjacent to third molars with horizontal angle of impaction showed the maximum external root resorption. The greatest percentage of caries, periapical radiolucencies and pericoronal radiolucencies in the maxillary second molar was seen in the ones adjacent to third molar with Class C depth of impaction. The highest percentage of caries were seen in vertical impactions. Periapical and pericoronal radiolucencies were seen to be the most prevalent in distoangular impactions while external root resorption in the second molars adjacent to the impacted third molar in mesioangular impaction.

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