

# Prevalence of External Root Resorption in Second Molar Associated with Impacted Mandibular Third Molars: A Radiographic Study

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DOI: <https://doi.org/10.52403/ijrr.20240248>

## ABSTRACT

**Background:** Mandibular third molars are the most frequently encountered impacted teeth in dental surgery cases. Impactions could be caused by differences in crown size, later development of roots, reduced skeletal growth and lack of space. If untreated, an impacted tooth can lead to a number of problems, including external root resorption, which is frequently observed in mandibular second molars. The current study was designed to investigate the prevalence of root resorption of mandibular second molar caused by impacted mandibular third molar.

**METHODS:** A cross-sectional, observational study using panoramic radiographs obtained from December 2019 to February 2022 from of patients who visited the Dental Clinic of the University of Benghazi. All radiographs were assessed about presence, location and severity of external root resorption of second molar. Positions of the impacted third molars were classified using two classification systems Pell, Gregory's and Winter classification. Data were tabulated and analyzed using Chi Square test; P value was set at 0.05.

**RESULTS:** Panoramic radiographs of 434 patients were examined that consisted of 244 (56.2%) female and 190 (43.7%) male. The prevalence of external root resorption of second molar was 213(49%). The severity of resorption was categorized as slight (70.4%), moderate (17.8%), and severe (11.7%), most of them was located at cervical third. External root resorption was proportionally higher in the impacted teeth with

class B (50.2%) and mesio-angular positions (62.9%).

**CONCLUSIONS:** Prevalence of external root resorption of mandibular second molars caused by Impacted third molars was high in this study especially in males. Mandibular third molars with a greater potential to cause the adjacent second molar's external root resorption were those in class B position according to Pell and Gregory classification and in mesioangular position regarding Winter classification.

**Keywords:** Panoramic, Radiograph, Root resorption, second molar, third molar, Impacted.

## INTRODUCTION

The final teeth to erupt in the oral cavity are the third molars, typically, root formation begins at age 15, and eruption happens in the 20 years [1,2]. Third molars are the most affected dental element [3] because of the later development of these roots, lack of space, or physical barrier in the trajectory of eruption. Numerous pathologies, including pericoronitis [4], carious lesions, odontogenic cysts or tumors [5], periodontal disease, and external root resorption (ERR) of neighboring teeth [6,7]. Although early diagnosis and understanding of its causes are essential for determining treatment. (ERR) in permanent teeth is a pathological process that typically results in dental loss [8,9].

Root resorption is a dental complication that causes loss of cementum and dentine and is linked to either pathological or physiological activity of the tooth resorbing cells [10]. Two primary categories can be used to categorize the etiology of root resorption: stimulation by infection or pressure and mechanical or chemical injury [11].

Resorption of roots occur when cementoblasts from the tooth's outer layer are removed, the root surface is exposed. This causes neighboring osteoclasts to become activated, which in turn promotes root resorption. This process is known as external root resorption [6,12]. In addition, tooth trauma, cysts, tumors, excessive force applied to orthodontic appliances, and chronic apical periodontitis can all cause root resorption [7,8].

An extremely helpful technique for evaluating dental pathologies and dental impaction is orthopantomography (OPG). OPG is very helpful in determining the third molar's location, angulation, and relationship to neighboring tooth structures. OPGs also have a low radiation dose and are reasonably priced [13].

The goal of the current study was to use panoramic radiographs to examine external root resorption of second molar caused by impacted third molar and correlate it with the third molars' impacted positions as stated in the Winter and Pell, Gregory classification.

## **MATERIAL AND METHOD**

### **Sample selection**

This study was approved by the Research Ethics Committee of the Benghazi University under No: 0183. This cross-sectional observational study was conducted using panoramic radiographs obtained from the archive of patients who visited the Dental Clinic of the University of Benghazi. The radiographs were produced between December 2019 and February 2022.

From a total of 1200 images, 434 images were included in this study. To avoid bias, all the

radiographs were examined by two well-trained dentists and intra and inter observer kappa correlation ranged from 0.8 to 0.76.

**The inclusion criterion** was that the image should present a second molar adjacent to the impacted mandibular third molar and the area of interest in OPG (Orthopantomogram) radiographs must clearly visible and free of artifacts. Age within 18 - 50 year.

**The exclusion criterion** was third molars that showed less than two-thirds of root development, Individuals who had extensive caries lesions on their second molars and radiologic evidence of intraosseous pathological features (such as cysts or tumors) related to their third molars were also disqualified from this study. This study did not include High-density materials (such as restorations, intracanal posts, orthodontic or surgical screws).

### **Radiographic assessment**

The lower jaw teeth were identified, and the impacted teeth's positions were categorized using the Pell and Gregory A, B, and C classification, which are as follows [14]:

Position A: The highest position of the impacted tooth is on a level with or above the occlusal plane of the second molar.

Position B: The highest position of the impacted tooth is below the occlusal plane but above the cervical level of the second molar.

Position C: The highest position of the impacted tooth is below the cervical level of the second molar.

The impacted teeth were also identified according to Winter's classification which assessed the long axis of the retained third molar in relation to the long axis of the second molar, in the following positions: vertical, when the long axis of the third molar is parallel to the long axis of the second molar; mesio-angular, when the long axis of the molar is tilted toward the long axis of the second molar in a mesial direction; disto-angular, when the long axis of the third molar is tilted toward the

long axis of the second molar in a distal direction; horizontal, when the long axis of the third molar is perpendicular to the long axis of the second molar [14].

The existence of ERR was confirmed by applying Al-Khateeb and Bataineh's criterion [15], which specified that ERR is present when there is evidence of substance loss in the root of a neighboring second molar. ERR was categorized as cervical, middle, or apical root third based on location, and severity was graded using the following criteria, which were provided by Ericson et al [16]. slight (involving very little of the dentin thickness) Moderate (involving half of the dentin) and severe (involving the pulp cavity).

### STATISTICAL METHODS

SPSS version 23 statistical software was used (SPSS Incorporation Chicago, IL, USA) for data entry and analysis, and the results were expressed as frequencies and percentages. chi-square test was used with significance level was set at the p value < 0.05.

#### The aim of study

The aim of this study was to assess the relationship between external root resorption (ERR) on the distal aspect of second molars' roots associated with impacted positions of third molar.

### RESULTS

The sample consisted of 434 panoramic radiographs representing 244 (56.2%) female

and 190 (43.7%) male. The prevalence of ERR was 49%, which was (43%) for female and 55% for male with statistical significant difference (P =.014). (Table 1)

Based on the Pell & Gregory classification of the impacted third molar positions (Table 1), the analysis of the prevalence of second molar ERR showed that ERR was much more common when the third molar was in class B (50.2) % followed by class C (36.2%) then A (13.6%). A statistical significant correlation was observed (p value =.005).

According to Winter classification of impacted third molar position (Table 1), the ERR was significantly more frequent (p=.000) when the adjacent third molar was in the mesio angular position (62.9%) followed by horizontal position (28.2%).

Regarding the location of ERR in the root (Table 3), ERR was more frequent in the cervical third (66.7%) followed by middle third (28.6%) then apical third (4.7%). According to the severity of ERR, most of the cases were classified as slight (70.4%) followed by moderate (17.8%) then sever (11.7%).

statistically significant correlation (P =.000) between the location and severity of ERR (Table 3). Slight ERR was most common in the cervical third (80.3%), moderate ERR was most common in the middle third (32.8%), and severe ERR was most common in the cervical third (7.7%).

Table 1. Association between external root resorption (ERR) of the second molar, sex, Pell and Gregory classification and winter classification.

Variable	ERR n (%)		Total	P value
	Present	Absent		
Sex				
Female(n=244)	107(43%)	137(56%)	244(56.2%)	.014
Male(n=190)	106(55%)	84(44%)	190(43.7%)	
Total	213(49%)	221(50.9%)	434(100%)	
Pell and Gregory classification				
A(n=82)	29(13.6%)	53(24%)	82(18.9%)	.005
B(n=189)	107(50.2%)	82(37.1%)	189(43.5%)	
C(n=163)	77(36.2%)	86(38.9%)	163(37.6%)	
Total	213(49%)	221(51%)	434(100%)	
winter classification				
Mesio angular(n=297)	134(62.9%)	163(73.8%)	297(68.4%)	

Disto angular(n=21)	7(3.3%)	14(6.3%)	21(4.8%)	.000
Horizontal(n=71)	60(28.2%)	11(5%)	71(16.4%)	
Vertical(n=45)	12(5.6%)	33(14.9%)	45(10.4%)	
Total	213(49%)	221(51%)	434(100%)	

Table 2. Association between external root resorption (ERR) of the second molar, location & severity.

		Location			Total
		Cervical	Middle	Apical	
ERR	Count	142	61	10	213
	%	66.7%	28.6%	4.7%	49%
		Severity			Total
		slight	Moderate	sever	
ERR	Count	150	38	25	213
	%	70.4%	17.8%	11.7%	49%

Table 3. Association between location & severity of ERR of second molar							P value
		Severity			Total		
		slight	Moderate	sever			
Location	cervical	Count	114	17	11	142	.000
		%	80%	12.0%	7.7%	66.6%	
	Middle	Count	31	20	10	61	
		%	50.8%	32.8%	16.4%	28.6%	
	Apical	Count	5	1	4	10	
		%	50%	10.0%	40%	4.6%	
Total		Count	150	38	25	213	
		%	70.4%	17.8%	11.7%		

## DISCUSSION

Teeth that are impacted are unable to reposition into their typical functional position. It is common for the third molar to experience this pathology. The genesis of impaction is thought to be the progressive evolutionary shrinkage of the jaw as a result of lack of stimulation of bone formation [17]. The impacted teeth may be caused severe consequences ranged from acute pericoronitis to other pathological conditions like caries, odontogenic cysts, and root resorption. third molar extraction may be recommended as a preventive measure [18].

The prevalence of ERR observed in this study 49% is consistent with the rates found in other studies, which varied from 20.17% to 81% [19,20].

According to the present study, there are statistically significant differences in ERR between the sexes: for females, it was 43%, and for males, it was 55%. Although this is in accordance with the other findings, which

showed that male patients had a higher frequency of impacted teeth-related ERR, the authors hypothesize that, this finding might be the result of sex hormones [21- 22]. This finding might be explained by the fact that due to male sex hormone so the men have more bone density than women, which leads to more impacted teeth and an increased incidence of ERR. In contrast to other studies in the literature, which have not shown that variations in the presence of ERR based on an individual's sex are statistically significant [23]. The current study found that the probability of second molar ERR was higher when the neighboring third molar was in the class B position (50.2%) as described by Pell and Gregory. This is consistent with a previous study that found that the Pell and Gregory B impaction classification has a higher ERR probability compared with classes A and C [4], which differs from other studies' findings that reported a higher presence of ERR associated with class C [24]. additionally, because of this,

findings about the relationship between the Pell and Gregory positions of third molars and the existence of ERR in the neighboring second molar are inconsistent, and more research over a longer period of time is required to fully understand this relationship. Our investigation of the angulation of impacted third molars using Winter classification revealed that, the mesio-angulated position was the most prevalent (68.4%), followed by the horizontal position 16.4 %. It is the most commonly encountered in mesio-angulation, our finding was agreement with other results in Iraqis, US, China, Thailand, and Spain. [25,26,27,28]. The wisdom tooth has a slight mesial tilt because of the straightening curve, thickness of the bone distally, lack of space in old age and delay in development and maturation [29]. In our observations, the predominance of mesio-angulation also caused greater rate of ERR in second molar (62.9%) which a possible explanation for this result is that the mesioangular position, although presenting a smaller area of contact, exerts greater pressure on the root of the second molar [24].

The results of this study revealed that ERR more prevalence in the cervical third (66.7%). This outcome was consistent with research showing that the cemento-enamel junction, located in the cervical third of the tooth, is more vulnerable to the inflammatory process that causes ERR [5]. The middle or apical third of the distribution, on the other hand, shows statistically significant ERR prevalence, according to Gökhan G *et al* [30].

The cervical third in this study showed a higher frequency of mild ERR (80.3%), with agreement with other studies which seen similar result [4, 19, 21]. The reason for this outcome could be that the cervical region is more susceptible to ERR than the other thirds due to the lack of protection (periodontal ligament or alveolar bone) [5]. The cervical third showed a severe ERR progression of 7.7%, which differs from other studies that

report the presence of severe ERR in the middle and apical thirds [31].

When second molar ERR reaches the root canal, it can cause excruciating symptoms and even result in tooth loss. Fortunately, early detection and treatment can minimize ERR and increase the likelihood that the tooth will survive [32, 33]. Treatment decisions for ERR may be significantly influenced by CBCT or OPG images [34].

Numerous outcomes of ERR treatment have been reported in the literature, and it has been demonstrated that root healing can occur when ERR is halted by applying an intracanal dressing containing calcium hydroxide to keep the tooth in the oral cavity for a while, [35, 36]. However, tooth extraction should be taken into consideration in severe cases of ERR [31]. There are no reports of randomized clinical trials on the efficacy of various ERR treatments, according to a systematic review [8]. Clinical trials are therefore required to determine the best methods for therapy.

The current study's findings may be utilized in clinical arguments to counsel patients with impacted third molars about the potential drawbacks of keeping them in place. These findings may therefore be helpful in recommending preventive exodontia to these patients. It is important to remember that the third molar should not be extracted if it is in a healthy position and performing its masticatory function.

## CONCLUSION

This study found that the prevalence of impacted mandibular third molar-related root resorption (ERR) in second molars was high, particularly in male patients comparable to what was found in other studies. Furthermore, there was also a greater incidence of mild ERR in the cervical thirds. An increased tendency for ERR was revealed by the mesioangular positions of impacted teeth according to the Winter classification and class B on the Pell & Gregory classification.

### Declaration by Authors

**Acknowledgement:** None

**Source of Funding:** None

**Conflict of Interest:** The authors declare no conflict of interest.

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- How to cite this article: Aziza E.S. Etira, Manal Shoukree Benamar. Prevalence of external root resorption in second molar associated with impacted mandibular third molars: a radiographic study. *International Journal of Research and Review.* 2024; 11(2): 451-457. DOI: <https://doi.org/10.52403/ijrr.20240248>

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