

## **Radiological Pathologies Associated with Impacted Mandibular Third Molars in a Group of Saudi Population**

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### **Abstract**

**Aim of the Study:** The purpose of this retrospective study was to determine the frequency of association of some pathologic changes with impacted mandibular third molars (M3s) as seen on orthopantomograms in a group of Saudi population.

**Materials and Methods:** Orthopantomograms of all patients who required removal of impacted third molars in the Department of Oral and Maxillofacial surgery, Dental Center, Ministry of Health, Hafr albatin, Saudi Arabia between January 2010 and December 2016, were collected and were reviewed.

**Results:** Among the total of 441 patients, radiographically detectable lesions that met the diagnostic criteria were seen in 263 patients (59.6%). Radiologic evidence of dental caries in the adjacent mandibular second molar (M2) (22%) followed by dental caries in M3 (16.5%). In the patients with impacted M3, periapical radiolucency was seen in 7.7% and pericoronal radiolucency was seen in 5.6%. Odontoma around the region of M3 was seen in 1.3% of the patients, and about 6.3% of the adjacent M2 had external root resorption.

**Conclusion:** It could be concluded from this study that a significant proportion of Saudis with impacted M3s had developed pathologies either in the adjacent second molar or in impacted M3s. Whether the high incidence of dental caries in the impacted third molars and adjacent second molar in this group of population should be considered as factor for prophylactic removal of M3s needs further research.

**Keywords:** *Impacted Mandibular Third Molars (M3s); Orthopantomograms; Saudi Population*

### **Introduction**

Impaction is cessation of eruption of a tooth caused by a physical barrier or ectopic positioning of a tooth. An impacted tooth is one which had failed to erupt completely or partially to its correct position in the dental arch and its eruption potential is lost. It is a well-established fact that the mandibular third molars (M3s) are the commonly impacted teeth in the jaw [1].

One of the primary indications for the removal of impacted mandibular third molars is those which are associated with pathologic changes. While there are therapeutic and prophylactic reasons for removal of impacted lower third molars, there is a debate on the removal of all asymptomatic impacted lower third molars.

Some authors advocate removal of impacted third molars, in spite of absence of any symptoms [1,2]. Studies have shown that the risk of development of pathological conditions in and around the follicles of M3 is apparently low [3,4].

There are established guidelines for the management of mandibular third molars which indicated that pathologies such as un-restorable caries, non-treatable pulpal and/or periapical pathology, and infection, as well as internal or external resorption of the tooth or adjacent teeth, and disease of the follicle including cysts or tumors are all well-defined criteria for third molar removal [5]. However, retention of M3 had been shown to be associated with recurrent pericoronitis, major cysts, deep space infections and angle fractures [6-9].

### Purpose of the Study

The purpose of this retrospective study was to determine the frequency of association of some pathologic changes with symptomatic impacted M3s as seen on orthopantomograms (panoramic radiographs) in a group of Saudi population.

### Material and Methods

The study involved all patients who required removal of impacted third molars in the Department of Oral and Maxillofacial surgery, dental center, ministry of health, Hafar Albatin, Saudi Arabia, between January 2010 and December 2016. Orthopantomograms of all patients who had symptomatic impacted M3s were collected and were reviewed. Further recorded data included patients' age, gender (male or female) and side of mandible involved (left or right). As this study involved reviews of records, it is exempted by the institution director.

The degree of angulation was determined by measurement of the angle between the longitudinal axis of the M3 and the occlusal plane. Shiller's classification was used to classify the angles of M3s as follows: vertical (between 80° and 100°), mesioangular (between 10° and 80°), distoangular (more than 100°) and horizontal (between 350° and 10°) [9].

The relative depth of M3 was grouped as per Archer's classification. Level A: the highest point of M3 is on the same level or below the occlusal plane of adjacent second molar (M2). Level B: the highest point of M3 is below the occlusal plane but above the cervical line of M2. Level C: the highest point of M3 is below the cervical line of M2 [9].

The relation of the M3 to the ramus of the mandible was grouped into the following: Level I: sufficient space is present between the ramus of mandible and M2 to accommodate the crown of M3; Level II: space is insufficient; Level III: completely buried and no space [9].

The primary study variables in this investigation were presence of dental caries in the impacted M3s, periapical radiolucency in relation to M3, pericoronal radiolucency in relation to M3, dental caries in adjacent M2, external root resorption in adjacent M2 and odontoma around the region of M3. The following were the diagnostic criteria for a detectable radiographic lesion:

1. Dental caries: a radiolucent area involving the enamel of the M3 or adjacent second molar.
2. Periapical radiolucency in M3: a radiolucent area in the apical one third of M3, not extending above its cemento-enamel junction.
3. Pericoronal radiolucency in M3: a radiolucent area around the crown of a completely embedded M3.
4. Odontoma: a radio-opaque mass of the same radio-density like dental tissues, which is surrounded by a radiolucent margin and is located adjacent to M3.
5. External root resorption: a clear discontinuity or irregularity in the root surfaces of adjacent second molar caused by its direct contact with M3.

When more than one lesion was seen in a patient's orthopantomogram, each lesion was recorded individually. Patients were excluded from the study where there was a difference in the diagnosis between the two investigators.

### Results

During the study period, 441 patients records were reviewed. Among them, 259 (58.7%) were male and 182 (41.3%) were female; and male to female ratio was 1.4:1. The age of the patients ranged from 17 to 52 years and the majority of the lesions (32.6%) were found in the age group of 20 to 24 years. About 59% of the radiographic lesions were seen on the right side of the mandible. The distribution of radiographic lesions grouped according to age, gender and the side of the mandible are shown in table 1.

Age group	Sex		Side of mandible			
	Male	Female	Left	Right	Total	Percentage
15 - 19	7	7	3	11	14	3.17
20 - 24	57	70	49	78	127	28.7
25 - 29	92	52	77	67	144	32.6
30 - 34	66	27	27	66	93	21
35 - 39	20	17	12	25	37	8.3
40 - 44	11	4	6	9	15	3.4
45 - 49	4	4	5	3	8	1.8
> 50	2	1	1	2	3	0.6
Total	259	182	180	261	441	

**Table 1:** Distribution of impacted M3s according to age, sex and side of the mandible involved.

While examining the ramus position and occlusal level of M3, 55% of the M3 were found to be in level II and 47% in position B. The most common combination of ramus position and occlusal level was IIB (24%) (Table 2).

Ramus position	Occlusal position			Total (%)
	A	B	C	
I	54	63	9	126 (29%)
II	72	108	63	243 (55%)
III	18	36	18	72 (16%)
Total	144 (33%)	207 (47%)	90 (20%)	441

**Table 2:** Distribution of impacted M3s according to the ramus and occlusal position.

The prevalence of radiographic lesions associated with M3 is shown in table 3. Out of the total patients included in this study, radiographically detectable lesions that met the diagnostic criteria were seen in 263 patients (59.6%). Radiologic evidence of dental caries in the adjacent M2 (22%) followed by dental caries in M3 (16.5%). In the patients with impacted M3, periapical radiolucency was seen in 7.7% and pericoronal radiolucency was seen in 5.6%. Odontoma around the region of M3 was seen in 1.3% of the patients. About 6.3% of the adjacent M2 had external root resorption.

Pathologic lesion	Number	Percentage
Caries in M3	73	16.5
Periapical radiolucency in M3	34	7.7
Pericoronal radiolucency in M3	25	5.6
Caries in M2	97	22
External root resorption in M2	28	6.3
Odontoma	6	1.3
No radiographic lesion	178	40.3
Total cases	441	100

**Table 3:** Distribution of radiographic lesions associated with impacted mandibular third molars.

## Discussion

When investigating the impacted mandibular third molar, selection of population sample is vital. In order to determine the true status of impacted M3 or rate of pathologic conditions associated with M3, a random sample of the general public is required [12]. However, taking radiographs in young patients just for the study purpose is debatable from an ethical point of view.

In the past, studies were conducted from selected population such as dental students [10] or patients reporting to the dental school [11-20], however, taking a sample only from the dental students or from the general population has some degree of bias [20]. To prevent such bias in this study, our study sample included only patients with symptomatic impacted M3.

The purpose of our study was to determine the rate of association of radiographic lesions associated with M3, and therefore our study sample included only patients with impacted M3 and not the general population. Similarly, all the patients in our study were Saudi nationals and thus the sample is considered to be homogenous.

Some prominent findings in our study related to the gender and side of mandible were a significant higher incidence of radiographic pathologies in males (56.8%) and involvement of right side of the mandible (57%). Although the reason for the high involvement of males in our study does not have legitimate explanations, we speculate that men in this country have poorer oral hygiene and better access to dental treatment than their counterpart.

It is not surprising that dental caries was the most common radiologic lesion, which accounted for 38.5% of patients seen in our study. This resonates well with earlier reports suggesting a high prevalence of caries in impacted M3 and M2 [12-15,20,21]. This could be due to the relative inaccessibility to these teeth for routine oral hygiene procedures, which allows a build-up of plaque and entrapment of food resulting in caries. However, the figures obtained in this study are probably an underestimate of the true rate of dental caries since the diagnosis was based only on radiographs.

The high frequency rate of dental caries in the partially erupted M3 or the adjacent M2 was well anticipated. Another reason for the development of caries is the angulation of the M3 and the point of contact that the mandibular second molar makes with M3. We found that the most commonly involved M3s with dental caries were mesioangular (38%) and horizontal (27%) impactions. McArdle and Renton [21] showed that 82% of the mandibular second molars with distal cervical caries had a mesial angulation of mandibular third molar between 40° and 80°. Recently, Srivastava, *et al.* found that 37.5% of mandibular second molar has distal caries when the mesial angulation of mandibular third molar between 30° to 70° [25].

Although impacted M3s are implicated in causing external root resorption in the adjacent M2, the true incidence is not known. In our study the frequency of external resorption in M2 was 5.4%. The incidence of external root resorption in M2 is found to be as low as 0.3% up to 7.5% [12,14,20,22,23]. This huge variation in the incidence rates reported is because of unambiguous definition of root resorption, while some authors consider it as a discontinuity and irregularity of the root surface, some defined it as a clear loss of the tooth substance.

Odontoma is seen very rarely around impacted M3s. In our study the incidence of odontoma is 0.3% which is similar to that the findings of Al-Khateeb and Bataineh (0.2%) [20]. In view of the characteristic patterns of presentation of odontoma in the radiograph, we believe that our radiologic diagnosis of odontoma should not differ much from the histopathologic diagnosis. The variation in the incidences of cystic lesions associated with impacted M3s in the previously published reports is due to the definition of cyst in the radiograph.

Most of the authors believe that a pericoronal radiolucency of greater than 2.5 mm shall be considered as dentigerous cyst [17]. However in a 4 year follow-up study, no changes were detected in the follicle size around the impacted M3s [10]. Therefore, for a final diagnosis of a cyst it is necessary to consider both the radiological and histopathological findings. Since ours is a radiologic study, we are not our discussion on the cystic lesions and tumors associated with impacted M3s would be inconclusive without histopathological reports.

The incidence of cysts and tumors associated with impacted M3 reported in the literature ranges from 1.2% - 3.5% [8-12,20]. In a review of 2190 patients who underwent biopsy in a previous study, it was found that 27 patients (0.9%) with impacted M3s were associated with cystic lesions (radicular cyst, dentigerous cyst and odontogenic keratocysts) [24].

Our study was entirely based on the findings in the orthopantomograms. This could be probably the only drawback in this study. However, we would take a sincere effort in future to conduct a clinico-pathological study involving the cysts and tumors associated with impacted M3s.

### Conclusion

It could be concluded from this study that a significant proportion of Saudis with impacted M3s had developed pathologies either in the adjacent second molar or in impacted M3s. Whether the high incidence of dental caries in the impacted third molars and adjacent second molar in this group of population should be considered as factor for prophylactic removal of M3s needs further research.

### Conflict of Interest

No conflict of interest.

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