

Angulation of Mandibular Third Molars as a Predictive Factor for Pericoronitis

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Abstract

Aim: The aims of this study were to investigate the association between pericoronitis and the angular position, state of eruption, and the depth of impaction of mandibular third molars as well as to compare these findings with similar studies.

Methods and Materials: A total of 242 patients ranging in age from 18 to 41 years of age suffering from pericoronitis were examined. Subjective and objective observations were recorded on a checklist that included the name, age, gender, type of pericoronitis and state of eruption, position of the affected tooth for each patient as well as any radiographic changes in the mandibular third molars.

Results: The peak age for the occurrence of pericoronitis was in the 21-25 year-old age group. The soft tissues adjacent to vertically inclined, partially erupted mandibular third molars at the level of or above the occlusal plane were the most commonly affected. There was a statistically significant association between radiographic changes and the mesioangular position of the tooth ($p < 0.002$) and the age group of the subject ($p = 0.004$), but the association was not statistically significant between the gender of the subject, type of pericoronitis, state of eruption, and depth of impaction.

Conclusion: The soft tissues adjacent to vertically inclined, partially erupted mandibular third molars were more frequently affected by pericoronitis than teeth that are soft tissue impacted or erupted. Mesioangular erupted

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third molars were the teeth most frequently associated with bone loss.

Clinical Significance: The soft tissues at highest risk of developing pericoronitis are those adjacent to mandibular third molars that are partially erupted, in a vertical position, and erupted to the level of or above the occlusal plane.

Keywords: Mandibular third molar, angulation, pericoronitis

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Introduction

Pericoronitis is by far the most common acute problem associated with third molars and with several possible predisposing factors related to the etiology of the disease.¹⁻⁶ These can be broadly divided into general factors and local factors. The relationship between pericoronitis and the different positions of mandibular third molars has been studied by several investigators.^{3,7,9-14}

Kay⁸ reported the majority of pericoronitis cases in his study were associated with mesioangular impactions of mandibular third molars followed by distoangular impactions of the same teeth. Bean and King¹ found vertical impactions to be associated with a greater number of pericoronitis cases and concluded the position of the tooth in the alveolus could act as a contributory factor to this inflammatory process. Piironen and Ylipaavaliniemi³ found about 60% of affected teeth were positioned at the plane of occlusion or higher. They also reported distoangular or vertical impacted mandibular third molars were more often associated with pericoronitis. Leone et al.⁹ concluded fully erupted, vertically positioned mandibular third molars in contact with the adjacent second molar, at or above the occlusal plane and partially encapsulated by soft or hard tissues, were at the highest risk for acute pericoronitis of the surrounding soft tissue. Lee and Kim¹³ found the vertically erupted mandibular third molar at the occlusal plane of the mandibular second molar was most likely to be afflicted with pericoronitis of the adjacent tissue. Halverson and Anderson¹⁴ evaluated the mandibular third molar position as a predictive criterion for the risk of pericoronitis and concluded the majority of cases (81.0%) involved vertically oriented mandibular



third molars, of which 79.1% were erupted to the approximate height of the occlusal plane of the arch. The remaining 20.9% were at or below the height of contour of the adjacent tooth. Similarly, Knutsson et al.¹⁵ found pericoronitis mostly adjacent to distally and mesially inclined mandibular third molars, whereas Punwutikorn et al.⁷ reported pericoronitis equally around teeth with either a distal or vertical inclination and to a lesser extent adjacent to teeth with a horizontal or mesial inclination.

Based on the preceding literature review, this study was designed to investigate the association between pericoronitis and the angular position, state of eruption, and depth of impaction of mandibular third molars then compare the findings with those of similar studies.

Methods and Materials

The subjects included in this prospective study consisted of all patients who presented to the Oral and Maxillofacial Surgery Unit of the Faculty of Dentistry at the Jordan University of Science and

Technology in Irbid, Jordan for treatment of signs and symptoms of pericoronitis in a mandibular third molar area during a six month period. Patients were divided into five year age groups starting from 16 to 35 years of age and 36 years of age and older.

To eliminate the possibility of a subject's symptoms being caused by conditions other than pericoronitis, only patients without radiographic signs of periodontal disease or other pathological conditions affecting the mandibular third molar area were included in this study. Using standardized examination instrumentation and a checklist, a single oral surgeon conducted patient interviews as well as clinical and radiological examinations. The checklist consisted of subjective and objective observations that included the following:

- Patient's name
- Patient's age
- Patient's gender
- Type of pericoronitis
- Eruption status
- Inclination and position of the tooth adjacent to the affected tissue

Pericoronitis was classified into acute, subacute, or chronic as follows:

Acute pericoronitis: The following signs and symptoms were recorded for acute type: trismus, extraoral swelling, sore throat, malaise or anorexia, pain, dysphagia, halitosis, and discharge of pus.

Subacute pericoronitis: Included cases that were characterized by pain, jaw stiffness, dysphagia, intraoral swelling, halitosis, and pus discharge in the absence of extraoral swelling and systemic body involvement.

Chronic pericoronitis: Mild discomfort,

intraoral swelling, and unpleasant taste were considered as signs and symptoms of chronic cases.

Intraoral periapical radiographs were taken using a standardized long-cone paralleling technique to determine the inclination, depth of impaction, and the radiographic changes of the mandibular third molar adjacent to the affected tissues.

The inclination of the mandibular third molars were classified as vertical, horizontal, mesioangular, or distoangular according to a modification of Winter's classification.¹⁶ Other positions such as buccoangular, linguangular, transverse, and inverted were classified as aberrant positions.

The depth of impaction was classified according to the Pell and Gregory system into class A, B, or C as follows:¹⁷

- **Position A:** The highest portion of the mandibular third molar is level with or above the occlusal plane.
- **Position B:** The highest portion of the mandibular third molar is below the occlusal plane but above the cervical line of the second molar.
- **Position C:** The highest portion of the mandibular third molar is below the cervical line of the second molar.

The state of eruption of the tooth was determined according to the criteria described by Punwutikorn et al.⁷ as follows:

- **Fully erupted tooth:** Its crown could be seen totally in the mouth.
- **Partially erupted tooth:** It has penetrated the oral mucosa and is partially visible in the mouth.



- **Completely unerupted tooth:** The tooth has not penetrated the oral mucosa.

Data were statistically analyzed using SPSS® Version 9.0 for Windows software (SPSS Inc, Chicago, IL, USA). The Chi square test was used with $p < 0.05$ considered significant.

Results

The sample in this study consisted of 242 patients with pericoronitis; 108 (44.6%) were males and 134 (55.4%) were females. The age of the subjects ranged from 18-41 years of age with the average being of 24.8 years. All the cases had pericoronitis on one side only. A total of 117 (48.3%) cases involved right mandibular third molars and 125 (51.7%) cases were associated with left mandibular third molars.

The peak occurrence of pericoronitis was seen in the 21-25 year-old age group which included 142 (58.7%) cases, whereas the least affected was the 36 years or older age group which included only 10 (4.1%) cases (Table 1).

Partially erupted mandibular third molars were the most commonly affected by pericoronitis as they accounted for 169 (69.8%) cases. Mandibular third molars fully covered with soft tissue were the least commonly affected as they accounted for only 11 (4.5%) cases. There were no cases involving mandibular third molars that were completely covered with bone (Table 2).

Mandibular third molars in position A were the most commonly affected by pericoronitis accounting for 194 (80.2%) cases. There were

Table 1. Distribution of subjects by age.

| Age Group | Number of Cases | % |
|--------------|-----------------|--------------|
| 16-20 | 30 | 12.4 |
| 21-25 | 142 | 58.7 |
| 26-30 | 39 | 16.1 |
| 31-35 | 21 | 8.7 |
| 36 or older | 10 | 4.1 |
| Total | 242 | 100.0 |

Table 2. Distribution of cases by the state of eruption of mandibular third molars.

| State of Eruption | Number of Cases | % |
|------------------------|-----------------|--------------|
| Full eruption | 62 | 25.6 |
| Partial eruption | 169 | 69.8 |
| Soft tissues impaction | 11 | 4.5 |
| Bony impaction | 0 | 0.0 |
| Total | 242 | 100.0 |

Table 3. Distribution of cases by the depth of impaction of mandibular third molars.

| Depth of Impaction | Number of Cases | % |
|--------------------|-----------------|--------------|
| Class A | 194 | 80.2 |
| Class B | 48 | 19.8 |
| Class C | 0 | 0.0 |
| Total | 242 | 100.0 |

Table 4. Distribution of cases by angular position of mandibular third molars.

| Angular Position | Number of Cases | % |
|------------------|-----------------|--------------|
| Vertical | 121 | 50.0 |
| Horizontal | 9 | 3.7 |
| Mesioangular | 51 | 21.1 |
| Distoangular | 61 | 25.2 |
| Aberrant | 0 | 0.0 |
| Total | 242 | 100.0 |

Table 5. Distribution of cases by the number of episodes of pericoronitis.

| Episodes | Number of cases | % |
|-----------------------|-----------------|--------------|
| One episode | 34 | 14.0 |
| Two episodes | 6 | 2.5 |
| Three episodes | 4 | 1.7 |
| Four episodes or more | 198 | 81.8 |
| Total | 242 | 100.0 |

Table 6. Distribution of cases according to age and radiographic changes.*

| Radiographic Changes | Age Group (years) | | | | | Total |
|----------------------|-------------------|-------|-------|-------|------|-------|
| | 16-20 | 21-25 | 26-30 | 31-35 | ≥36 | |
| No % | 27 | 135 | 37 | 16 | 7 | 222 |
| | 12.2 | 60.8 | 16.7 | 7.2 | 3.2 | 100.0 |
| Yes % | 3 | 7 | 2 | 5 | 3 | 20 |
| | 15.0 | 35.0 | 10.0 | 25.0 | 15.0 | 100.0 |
| Total % | 30 | 142 | 39 | 21 | 10 | 242 |
| | 12.4 | 58.7 | 16.1 | 8.7 | 4.1 | 100.0 |

* p=0.004

Table 7. Distribution of cases according to angular position of mandibular third molars and radiographic changes.*

| Radiographic Changes | Angular Position | | | | | Total |
|----------------------|------------------|------------|--------------|--------------|----------|-------|
| | Vertical | Horizontal | Mesioangular | Distoangular | Aberrant | |
| No % | 115 | 8 | 39 | 60 | 0 | 222 |
| | 51.8 | 3.6 | 17.6 | 27.0 | 0.0 | 100.0 |
| Yes % | 6 | 1 | 12 | 1 | 0 | 20 |
| | 30.0 | 5.0 | 60.0 | 5.0 | 0.0 | 100.0 |
| Total % | 121 | 9 | 51 | 61 | 0 | 242 |
| | 50.0 | 3.7 | 21.1 | 25.2 | 0.0 | 100.0 |

* p<0.00

no cases involving mandibular third molars in position C (Table 3).

Vertically erupted mandibular third molars were the most commonly affected by pericoronitis accounting for 121 (50.0%) cases. There were no cases involving mandibular third molars in aberrant positions (Table 4).

Most patients suffered from recurrent pericoronitis; 198 (81.8%) of them had four or more acute episodes, whereas only 34 (14.0%) patients had pericoronitis for the first time (Table 5).

Only 20 (8.3%) cases were associated with radiographic change with the only change being alveolar bone resorption at the distal surface of

the mandibular second molar. Considering patient age, seven (35.0%) cases were within the 21-26 year-old age group and only two (10.0%) were within the 26-30 year-old age group (Table 6).

Of the cases with radiographic changes, 14 (70.0%) were associated with partially erupted mandibular third molars and six (30.0%) were with fully erupted mandibular third molars. In 19 (95.0%) of the cases with radiographic changes the mandibular third molars were in position A, while in only one (5.0%) case the tooth was in position B, and none involved teeth in position C. None of the fully impacted molars in soft tissues showed any radiographic changes.

Of the mandibular third molars that were associated with radiographic changes 12 (60.0%) were in the mesioangular position, six (30.0%) cases were in the vertical position, and only one (5.0%) case in each of distoangular and horizontal positions (Table 7).

Using the Chi-square test a statistically significant association was found between radiographic changes and the angular position of the tooth ($p < 0.002$) and between radiographic changes and the age of the subjects ($p = 0.004$). There was no association between radiographic changes and either the gender of the subject ($p = 0.114$), state of eruption ($p = 0.561$), or depth of impaction ($p = 0.063$).

Discussion

Pericoronitis is a chronic condition with a high recurrence rate of acute exacerbations. Most of the patients affected by peri-coronitis experience only a mild discomfort, but it may cause an acute illness with severe pain, dysfunction, systemic upset, and serious complications.³ As stated previously, several studies have been conducted to identify the teeth at highest risk to develop peri-coronitis in the adjacent tissue.

The results of this study showed female patients (55.4%) were slightly more commonly affected by peri-coronitis than males (44.6%). These results are similar to the findings of Bataineh and Al Qudah² in which female patients constituted 56.7% of their sample while males constituted 43.3%.

On the other hand, the results of the present study differ from the findings of Howe⁴, Kay⁸ as well as Lee and Kim¹³ who found both sexes to be equally affected by peri-coronitis. Whereas other investigators have reported females were affected by peri-coronitis twice as frequently as males.³

The slight difference between the male and female ratio in the present study may be explained by the ratio of males to females who sought care in the Oral and Maxillofacial Surgery Unit of the Faculty of Dentistry at the Jordan University of Science and Technology in Irbid, Jordan for treatment of signs and symptoms of peri-coronitis in a mandibular third molar area.

It is generally accepted that peri-coronitis can affect patients of any age, but it is more frequently seen in the 17-25 year-old age group.^{1,2,7,18} This was confirmed by the results of the present study where (71.1%) of the cases were within the 16-25 year-old age group.

It is well known eruption of mandibular third molars occurs mostly between 17-21 years.^{7,19} Thus, most of the cases of peri-coronitis do not occur during eruption but rather some years later. This could be attributed to the long exposure to irritants from the oral cavity.

Also, similar to the results of other studies^{7,9,12,20-22} the present study showed the tissues adjacent to partially erupted mandibular third molars were more commonly affected by peri-coronitis. This result is not in agreement with the findings of Hattab²³ who stated mandibular third molars partially covered by soft tissues presented many more pathologic problems than molars completely covered or fully erupted. The results are also not consistent with the findings of Punwutikorn et al.⁷ who stated partially erupted mandibular third molars were associated with more symptoms than completely unerupted teeth. In the same context the present study showed mandibular third molars completely impacted in soft tissues were affected by peri-coronitis in only a minority of cases. This is less than reported by Brickly et al.²⁰ but comparable to the results of Yamaoka et al.²⁴ None of the cases in the present study involved a mandibular third molar that was fully impacted in bone.

A possible explanation for these findings may be related to the initiation of inflammation in the potential space between the crown of the tooth and the overlying soft tissue. In the partially erupted teeth this space is more likely to trap food debris leading to stagnation, bacterial colonization, and subsequent inflammation.

In agreement with previous studies^{1,3,9,11,13,14} the present study showed the tissues adjacent to vertically erupted mandibular third molars were the most frequently affected by pericoronitis. However, this is in disagreement with the findings of Venta et al.¹² who found soft tissue adjacent to mandibular third molars in a distoangular position was more commonly involved in pericoronitis. The findings of the present study are also in disagreement with the findings of Kay⁸, Hattab²³, and Kuntusson et al.¹⁵ who found the tissues adjacent to mesioangularly erupted mandibular third molars were the most frequently affected by pericoronitis.

The contribution of mesioangular impaction to pericoronitis in the present study was 21.1%, which is comparable to the results of Leone et al.⁹ in which 16.0% of their cases were in a mesioangular position.

The correlation seen between pericoronitis and the angular position of the mandibular third molar may be due to the fact some angular positions of mandibular third molars in Jordanians are more frequent than others. However, when the results of two studies conducted on a Jordanian population on the frequency distribution of mandibular third molar impaction^{10,25} compared to the frequency distribution of pericoronitis seen in this study, it is unlikely the above mentioned correlation has resulted from the fact some inclinations of mandibular third molars are more frequent than others.

What has been implied for the angular position can also be implied for the depth of impaction of mandibular third molars in that the correlation seen between pericoronitis and the depth of impaction may be due to the fact some positions of mandibular third molars (without pericoronitis) are more frequent than others. Three studies performed on Jordanian populations reported different percentages for each position. One study found 42% of mandibular third molars were in position A, 20% were in position B, and 37% were

in position C.²³ Another study found 47.7% of mandibular third molars were in position A, 12.7% were in position B, and 39.6% were in position C.²⁵ The third one found 66.0% of mandibular third molars were in position B and 34.0% were in position C.³⁰

The findings of the present study showed tissue adjacent to mandibular third molars in position A were the most commonly affected by pericoronitis (80.2%), followed by those in position B (19.8%), and no cases involved teeth in class C position. Thus, it is unlikely the correlation has resulted from some positions of mandibular third molars being more frequent than others since these results differ from the frequency distribution of mandibular third molars impaction (without pericoronitis) described earlier. Therefore, these findings may be due to teeth in position "A" being more prone to trauma from opposing teeth which could help to initiate or aggravate the problem than teeth in other inferior positions. Another possible explanation could be most partially erupted teeth in the present study (67.0%) were found to be at or above the level of the occlusal plane rendering them more vulnerable to pericoronitis in the adjacent tissue. Teeth erupted to or above the level of the occlusal plane are at a higher risk for the development of pericoronitis in the adjacent tissue.^{3,9,11-14}

It is well known pericoronitis is a recurrent condition. Venta et al.¹² found about half of their subjects reported previous episodes of pericoronitis relating to the same tooth and only 15% experienced it for the first time. Similarly, Bean and King¹ stated half of their subjects reported previous flare ups of a chronic or subacute pericoronitis.

In the present study 86% of the cases had at least two episodes of pericoronitis and only 14% experienced it for the first time. A possible explanation for this difference could be the prophylactic extraction of mandibular third molars before they caused such problems or promptly after causing such a problem. This was common practice in 1971 when the Bean and King¹ study was conducted. Furthermore, Venta et al.¹² found 75% of third molars that caused an acute pericoronitis were extracted to prevent subsequent recurrence of the problem.

In the present study an association was found between age and the presence of radiographic changes. Most of these changes (35.0%) were found in the 21-25 year-old age group, followed by the 31-35 year-old age group (25.0%). This could be explained by the finding of recurrence of pericoronitis in 58.7% and 8.7% of the 21-25 and 31-35 year age groups, respectively. This is consistent with the findings of Laskin³¹ who reported repetitive episodes of pericoronitis could result in bone destruction between the mandibular third and second molars.

The results of the current study is in agreement with the results of studies by Yamaoka et al.²⁴ and Godfrey³² by demonstrating a strong association between the inclination of the mandibular third molar and the presence of radiographic changes. Whereas, Blakey et al.¹¹ claimed there was no alveolar bone loss seen in association with pericoronitis. This difference between their findings and the findings of the current study could be attributed to the inclusion of only

young patients with mild signs and symptoms of pericoronitis in that study.

Conclusion

The tissue adjacent to vertically inclined, partially erupted mandibular third molars that were positioned at or above the level of the occlusal plane were more frequently affected by pericoronitis than teeth that are soft tissue impacted or erupted. Bone loss between the mandibular second and third molars is the only radiographic change associated with pericoronitis and strongly related to the angulation of mandibular third molars. Mesioangular erupted third molars were the most frequently associated tooth with bone loss.

Clinical Significance

The soft tissues at highest risk of developing pericoronitis are those adjacent to mandibular third molars that are partially erupted, in a vertical position, and erupted to the level of or above the occlusal plane.

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