



## THE RELATIONSHIP BETWEEN THE SLOPE OF THE MESIOANGULAR LOWER THIRD MOLARS AND THE PRESENCE OF SECOND MOLAR DISTAL CARIES: A RETROSPECTIVE STUDY

*Mesioangular Pozisyonadaki Mandibular Üçüncü Molar Dişlerin Eğimi ve Komşu İkinci Molar Dişlerin Distal Yüzeyinde Çürük Varlığı Arasındaki İlişki: Retrospektif Bir Çalışma*

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### ABSTRACT

**Objective:** The purpose of this study was to examine the relationship between the degree of mesioangular mandibular third molar teeth and the presence of distal caries in the second molar teeth.

**Materials and Methods:** In this retrospective study, panoramic radiographs of 617 patients (328 females, 289 males) with impacted teeth in partially erupted mesioangular position were examined. The angle between the mandibular occlusal plane and the occlusal surface of the mandibular third molar was measured. Third molar teeth in mesioangular positions with an angle between 11° and 30° were classified as Group 1, an angle between 31° and 50° as Group 2, and an angle between 51° and 70° as Group 3. For each group, the presence of caries in the distal contact point of adjacent second molar teeth was detected.

**Results:** A total of 816 mandibular third molar teeth in the mesioangular position were analyzed. Of these, 439 (53.8%) were in females and 377 (46.2%) were in males. The prevalence of caries in the distal aspect of the second molar teeth was 34.5% in males and 21.4% in females ( $p < 0.001$ ). A statistically significant difference was found between the groups ( $p < 0.05$ ). The results showed that a slope of 51° to 70° in mandibular third molar presents a higher risk for caries formation in the distal aspect of second molar teeth.

**Conclusions:** Early prophylactic extraction of impacted mandibular teeth with a slope between 51° and 70° may prevent caries formation in the distal aspect of adjacent second molar teeth.

**Key Words:** Oral surgery; dental caries; third molar

### ÖZ

**Amaç:** Bu çalışmanın amacı; mesioangular pozisyonadaki mandibular üçüncü molar dişlerin eğimi ile komşu ikinci molar dişlerin distal yüzeyindeki çürük varlığı arasındaki ilişkiyi incelemektir.

**Gereç ve Yöntem:** Bu retrospektif çalışmada, alt çenede kısmen sürmüş mesioangular pozisyonda gömülü diş olan, 617 hastanın (328 kadın, 289 erkek) panoramik radyografları incelendi. Mandibular okluzal düzlem ve mandibular üçüncü moların okluzal yüzeyi arasındaki açı ölçüldü. 11° ile 30° arasında bir değere sahip mesioangular üçüncü molar dişler Grup 1 olarak, 31° ve 50° arasındakiler Grup 2 olarak, 51° ve 70° arasındakiler Grup 3 olarak sınıflandırıldı. Ardından komşu ikinci molar dişin distal temas noktasındaki çürük varlığı tespit edildi.

**Bulgular:** Mesioangular pozisyonda toplam 816 adet mandibular üçüncü molar diş analiz edildi. Bunlardan 439'u (%53,8) kadınlarda, 377'si (%46,2) erkeklerde görüldü. İkinci molar dişin distalinde çürük prevalansı erkeklerde %34,5, kadınlarda %21,4 idi ( $p < 0,001$ ). Açısal değerlere göre oluşturulan gruplar arasında istatistiksel olarak anlamlı bir fark görüldü ( $p < 0,05$ ). Sonuçlar, 51° ile 70° arasında bir eğime sahip mandibular üçüncü molar dişlerin, ikinci molar dişlerin distal yüzeyinde çürük oluşumu için daha yüksek bir risk arzettiğini gösterdi.

**Sonuç:** 51° ile 70° arasında bir eğime sahip gömülü mandibular üçüncü molar dişlerin profilaktik olarak erken çekimi, komşu ikinci molar dişlerin distal yüzeyinde çürük oluşumunu önleyebilir.

**Anahtar Kelimeler:** Oral cerrahi, diş çürükleri, üçüncü molar diş

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## INTRODUCTION

Teeth that are completely or partially within the bone and soft tissue with no placed in occlusion for various reasons, despite passing the normal eruption age, are called impacted teeth. Impacted teeth may cause various pathologies, such as pericoronitis, infection, unrestorable caries, root resorption in adjacent teeth, periodontal bone loss, cystic lesions, and neoplasms.<sup>1</sup> The impacted position can be horizontal, vertical, mesioangular, distoangular, buccolingual, or inverted.<sup>2</sup> Shiller stated that when the angle between the mandibular occlusal plane and the occlusal plane of the third molar is between  $11^{\circ}$  and  $70^{\circ}$ , the tooth position is mesioangular.<sup>3</sup> Mesioangular and horizontal positions are more frequently associated with pathological conditions.<sup>1</sup>

The teeth with the highest impaction rate are mandibular third molar teeth.<sup>4</sup> Removal of an impacted third molar is one of the most commonly performed procedures in oral surgery. These teeth are surgically removed for prophylactic, orthodontic, and prosthetic reasons, or for the diagnosis of associated pathologies. The caries formed in the distal part of the second molar teeth justify prophylactic removal of the third molar teeth. McArdle and Renton<sup>5</sup> reported that distal caries in the second molar will not develop in the absence of the third molar. Furthermore, there is a higher risk of caries formation in the second molar distal associated with partially-erupted mesioangular mandibular third molar teeth.<sup>6</sup>

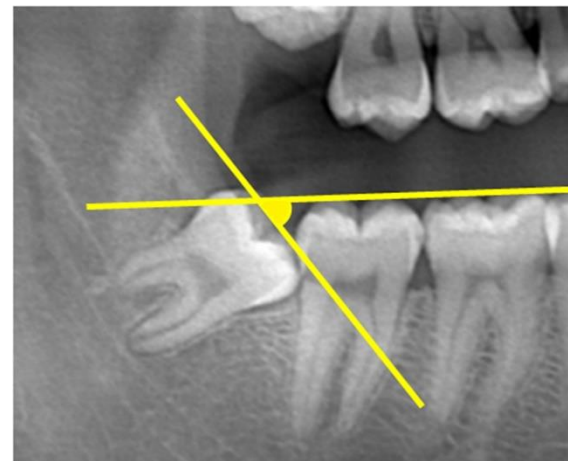
The purpose of this study was to examine the correlation between the degree of mesioangular mandibular third molar teeth and the presence of distal caries in the second molar teeth by measurements performed on panoramic radiographs.

## MATERIALS AND METHODS

In this retrospective study, panoramic radiographs of 617 patients (328 females, 289 males) with impacted teeth in partially erupted

mesioangular position were examined. All patients were transferred to the Department of Oral and Maxillofacial Surgery, Faculty of Dentistry of Gaziosmanpasa University between September 2013 and August 2017. This study included 816 mandibular third molar teeth in the mesioangular position. This study was approved by the local Ethics Committee (Project no: 17KAEK160).

Shiller's method<sup>3</sup> was used to determine if teeth were in the mesioangular position. According to this method, the angle between the mandibular occlusal plane and the occlusal surface of the mandibular third molar was measured (Figure 1).



**Figure 1:** Orthopantomograph showing how angulation of the third molar was measured.

Angular measurements were made using the Image J software (National Institutes of Health, Bethesda, MD, USA). Values between  $11^{\circ}$  and  $70^{\circ}$  were determined as being mesioangular positions. The mandibular third molar teeth in mesioangular positions were then categorized into three groups. Third molar teeth with an angle between  $11^{\circ}$  and  $30^{\circ}$  were classified as Group 1, an angle between  $31^{\circ}$  and  $50^{\circ}$  as Group 2, and an angle between  $51^{\circ}$  and  $70^{\circ}$  as Group 3. For each group, the presence of caries in the distal contact point of adjacent second molar teeth was detected from the panoramic radiographs. Patients with pre-existing restorations in adjacent second molar teeth were excluded from the study.

Two of the authors reviewed the panoramic radiographs. Prior to the investigation, calibration of the examiners was undertaken until intra-examiner reliability and reproducibility was achieved. To evaluate intra-examiner agreement, Cohen's Kappa test applied. When those X-rays causing a difference of opinion were analysed by both clinicians together, a consensus was reached by discussion.

IBM SPSS Statistics for Windows, version 20.0 (IBM Corp, Armonk NY, 10504, USA) was used for statistical analyses of the study data. Normality and variance were tested using the one-sample Kolmogorov-Smirnov test. In multiple comparison of measurements of the groups with normal distribution, One-way ANOVA test and Tukey post hoc test were used. When the  $p$  value was less than 0.05, the difference between the variables was considered statistically significant.

## RESULTS

Panoramic radiographs of 617 patients were examined in this study. The age of the patients ranged from 16 to 54 (average:  $25.64 \pm 7.03$ ) years. Age and gender distributions are shown in Table 1.

**Table 1:** Age and gender distribution of patients with mandibular third molar teeth in the mesioangular position

Age groups	Female	Male	Total
16-20	101	55	156
21-25	135	78	213
26-30	45	71	116
31-35	30	43	73
$\geq 36$	17	42	59
<b>Total</b>	<b>328</b>	<b>289</b>	<b>617</b>

A total of 816 mandibular third molar teeth in the mesioangular position were analyzed. Of these, 439 (53.8%) were in females and 377 (46.2%) were in males. The prevalence of caries in the distal aspect of adjacent second molar teeth was 27.5% ( $n = 224$ ). There was a

statistically significant difference between the gender of the patients and the prevalence of caries in the distal second molar teeth ( $p < 0.001$ ). The prevalence of caries in the distal aspect of the second molar teeth was 34.5% in males and 21.4% in females (Table 2).

**Table 2:** Presence of caries on second molar distal aspect associated with gender

	Distal caries in second molar		Total
	Yes	No	
<b>Female</b>	94 (21.4%)	345 (78.6%)	439
<b>Male</b>	130 (34.5%)*	247 (65.5%)	377
<b>Total</b>	224 (27.5%)	592 (72.5%)	816

\* $p < 0.001$

A statistically significant difference was found between the groups when the prevalence of caries in the distal aspect of the adjacent second molar teeth was evaluated. Group 3 had the highest ratio of the three groups (Table 3).

**Table 3:** Presence of caries in the distal aspect of the second molar teeth

	Groups						$p$ values			
	Group 1 11-30 (mean $20.8 \pm 5.1$ )		Group 2 31-50 (mean $40.7 \pm 5.4$ )		Group 3 51-70 (mean $60.6 \pm 5.9$ )		p	$p_{1,2}$	$p_{1,3}$	$p_{2,3}$
	Yes	No	Yes	No	Yes	No				
Distal caries in second molar	22 (15.1%)	124 (84.9%)	81 (24.8%)	246 (75.2%)	121 (35.3%)	222 (64.7%)	<0.05	0.070	0.000*	0.006*

\* $p < 0.05$

## DISCUSSION

The prophylactic removal of an impacted tooth is defined as the surgical removal of the tooth when there is no pathology or symptom associated with the impacted tooth. The removal of a third molar tooth associated with a pathological condition is usually an easy decision. Some authors advocate prophylactic extraction of impacted third molar teeth due to the possibility of causing pathological conditions, such as caries and periodontal disorder.<sup>1,7-9</sup> However, some researchers believe there is insufficient evidence to

prophylactically extract these teeth.<sup>10, 11</sup> Distal caries of mandibular second molar teeth are a common complication associated with impacted third molar teeth. In this study, the relationship between the third molar teeth in the mesioangular position and the presence of caries in the distal aspect of second molar teeth was examined. We found that the prevalence of caries was highest in teeth with a slope between 51° and 70°.

There is a higher risk of caries formation in the distal aspect of adjacent second molars associated with partially sustained mesioangular mandibular third molar teeth compared with other angulations.<sup>6, 12</sup> In previous studies, the prevalence of caries formation in the distal aspect of adjacent mandibular second molar teeth has varied between 7% and 32%.<sup>7-9, 13</sup> In this study, the prevalence rate was 27.5%. This range of rates may be related to cultural differences between patients, such as oral hygiene habits, socio-economic status, and diagnostic methods used. In this study, we believe that the evaluation of the mandibular teeth, in the mesioangular position only, may result in a higher rate.

The relationship between the slopes of the impacted third molar teeth and caries formation in the distal aspect of second molar teeth was examined in this study. Ozec *et al.*<sup>9</sup> reported that values of 31° and 70° led to a significant risk of second molar distal caries. Falci *et al.*<sup>14</sup> reported that when the angulation of mandibular third molar was between 31° and 108° there was a greater possibility of distal caries on the second molar. Chang *et al.*<sup>8</sup> emphasized that mesial angulation of 41°- 80° causes a higher incidence of adjacent second molar caries than in other angulations in the Korean population. The increase of the slope can increase plaque retention and food package on the distal surface of adjacent second molar teeth. In our study, mesioangular values between 11° and 70°, which were measured according to the Shiller<sup>3</sup> method, were divided

into subgroups. We found the highest caries risk in the distal aspect of second molar teeth between 51° and 70° (average: 60.61° ± 5.91) in Turkish population. The results of this study are similar with the literature.

Caries formation in the distal aspect of second molar teeth is a long-lasting process that evolves over time and increases with continued exposure to the oral cavity. It has been reported that the incidence rate of caries in the distal aspect of second molar teeth increases with age.<sup>5, 9, 14</sup> In this study, the prevalence of caries in the distal aspect of second molar teeth was higher in males than in females. We believe this is because of the number of young people between the ages of 16 and 25 was higher among women.

Extraoral radiographs have lower sensitivities than intraoral radiographs in detecting proximal caries.<sup>15,16</sup> Demineralization is important in the detection of caries by radiography. Panoramic radiography may not detect early caries lesions with inadequate demineralization; however, deep caries lesions that have advanced to the dentine can be detected. Akarslan *et al.*<sup>16</sup> reported that when interproximal caries were detected in mandibular molar teeth, there was no significant difference between bitewing and periapical radiographies, but panoramic radiographs were less accurate for this diagnosis. Intraoral radiographs, such as bitewing, are not routinely used in the impacted third molar tooth surgery. In this study, which was conducted with panoramic radiographs of patients with complaints of impacted third molars, the detection of caries by extraoral radiography can be considered a weakness of the study.

## CONCLUSIONS

The results of this study showed that a slope of 51° to 70° in mandibular third molar teeth in the mesioangular position presents a higher risk for caries formation in the distal aspect of adjacent second molar teeth. This data will

help clinicians in making decision on prophylactic extraction of third molar teeth without symptoms. Early prophylactic extraction of impacted mandibular teeth with a slope between 51° and 70° may prevent caries formation in the distal aspect of adjacent second molar teeth.

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