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Özgün Araştırma Makalesi

Effect of Mandibular Third Molars on Angulation of Mandibular Second Molars and Canines

Alt Üçüncü Molar Dişlerin Alt İkinci Molar ve Alt Kanin Dişlerinin Eksen Eğimlerine Olan Etkisi

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ABSTRACT

Aim: This study aims to investigate the effect of mandibular third molars on angulation of mandibular second molars and canines.

Material and Method: A total of 16 patients (10 female and 6 male) were included to this study. Two panoramic radiographs were taken from all the patients. All mandibular third molars were available in the first panoramic radiograph. The second panoramic radiograph was taken approximately 124.81 ± 21.63 weeks following unilateral mandibular third molar extraction. Angulations of the second mandibular molars and mandibular canines were measured both on the first and second panoramic radiographs at the both side extraction and non-extraction side. Paired t-test was used to compare statistically the angulation changes.

Results: At the extraction side, differences were observed in the angulation of the second molars and canines showing upright movement. However, these differences were statistically not significant ($p>0.05$). At the non-extraction side, both the second molars and canines showed statistically significant upright movement ($p<0.05$). However, the difference was only for the second molars.

Conclusion: It was concluded that mandibular teeth are progressively moving upright position and not extracting the mandibular third molars increases the uprighting effect on the second molars.

Keywords: Molar; Cuspid; Orthodontics; Radiography

ÖZET

Amaç: Bu çalışmanın amacı, alt üçüncü molar dişlerin alt ikinci molar ve kanin dişlerin açıları üzerindeki etkisini araştırmaktır.

Gereç ve Yöntem: Bu çalışmaya toplam 16 hasta (10 kadın ve 6 erkek) dahil edildi. Tüm hastalardan iki panoramik radyografi alındı. İlk panoramik radyografide tüm mandibular üçüncü molar dişler mevcuttu. İkinci panoramik radyografi, tek taraflı mandibular üçüncü molar diş çekiminin yaklaşık 124.81 ± 21.63 haftasında çekildi. Birinci ve ikinci panoramik radyografilerde alt ikinci molar ve kanin dişlerin açıları ölçüldü. Bu açılar, çekim yapılan ve çekim yapılmayan tarafta değerlendirildi. Angulasyon değişikliklerini istatistiksel olarak karşılaştırmak için eşleştirilmiş t-testi kullanıldı.

Bulgular: Çekim yapılan tarafta hem alt ikinci molar hem de kanin dişlerin eksen eğimlerinde dikleşme hareketi görüldü ancak istatistiksel olarak anlamlı değildi ($p>0.05$). Çekim yapılmayan tarafta hem alt ikinci molar hem de kanin dişlerin eksen eğimlerinde dikleşme hareketi görüldü. Ancak bu fark sadece ikinci molar dişlerde istatistiksel olarak anlamlıydı ($p<0.05$).

Sonuç: Mandibular dişlerin eksen eğimlerinin giderek dikleştiği ve alt üçüncü molarların çekilmemesinin ikinci molarlar üzerindeki dikleştirme etkisini arttırdığı görülmüştür.

Anahtar Kelimeler: Azı diş; Kuspid; Ortodonti; Radyografi

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INTRODUCTION

Late anterior dental crowding is a common type of malocclusion; in most cases, the size of the teeth and the length of the arch are mismatched. The effect of the mandibular third molars on anterior mandibular crowding has previously been discussed; however, no consensus has been reached on this topic.[1]

Third molars may have a role in late anterior crowding.[2] Some authors reported that anterior crowding was more frequently seen in patients with impacted third molars than patients who had properly erupted teeth.[3,4,5] Bergstrom and Jensen[6] were the first authors to analyze this effect in the developing dental arch, and they stated that there was a relationship between these teeth and changes in incisor teeth. Husain and Rengalakshmi[7] stated that this relationship might be due to the force applied to adjacent teeth during eruption of the third molars. Similarly, Abdulla *et al*.[8] claimed that the existence of impacted third molars might lead to dental crowding in the mandibular arch. Al-Sayagh *et al*.[9] reported a higher number of impacted third molars in the crowding group than the non-crowding group. Tufekci *et al*.[10] reported that most orthodontists in the United States and Sweden believe that mandibular third molars exert anterior forces while erupting; however, despite this belief, they do not believe entirely that mandibular third molars cause dental crowding.

In contrast, after an extensive literature review, Bishara[11] concluded that third molars do not play a considerable role in mandibular anterior crowding. Karasawa *et al*.[12] clinically and radiographically examined 300 healthy volunteers and found no correlation between mandibular third molars and mandibular dental arch crowding.

In this retrospective split-mouth study, the effect of mandibular third molars on the axes of the second molar and canine teeth was evaluated statistically.

MATERIAL AND METHOD

We conducted a retrospective split-mouth study after obtaining approval from our institution's ethics committee (2019/06) and following the Declaration of Helsinki on medical protocol and ethics. We searched our radiograph database between November 2012 and April 2018. All panoramic radiographs were taken with the same device. Patients whose panoramic radiographs were taken twice and who also had bilateral mandibular third molars on the first panoramic radiograph were identified. Among these patients, only ones who had one mandibular third molar on the second panoramic radiograph were selected. As a result, patients who had undergone one mandibular third molar extraction and then underwent a second panoramic radiography during the time interval.

The inclusion criteria were:
- Orthopantomographs with high quality.
- In the first radiograph, the positions of both mandibular third molars were vertical.
- The second panoramic radiograph was taken approximately 90 weeks following the extraction of one mandibular third molar.

The exclusion criteria were:
- The patients who had undergone any type of orthodontic treatment.
- Distoangular, horizontal or mesioangular positioned impacted mandibular third molars.
- Extraction of any other teeth on the mandibular dental arch during that period.
- Presence of another impacted or supernumerary tooth on the mandibular dental arch.
- Prosthetic restorations or dental implants on the mandibular dental arch.

A total of 16 patients (10 females and 6 males) aged between 21 and 39 (mean 26.31 ± 4.67) years met the study criteria and were included in the study.

The second radiograph was taken an average 124.81 ± 21.63 weeks (min 96.29 weeks, max 160.14 weeks) after the third molar extraction.

Measurement method:

We measured the angulations of the mandibular second molars and mandibular canines on the first and second panoramic radiographs. Angulation of the mandibular second molar was defined as the angle between the long axis of the tooth and a line starting from the center of the occlusal surface and ending at the mental foramen. Angulation of the mandibular canine was defined as the angle between the long axis of the tooth and the line starting from the cusp tip and ending at the mental foramen (Fig. 1).

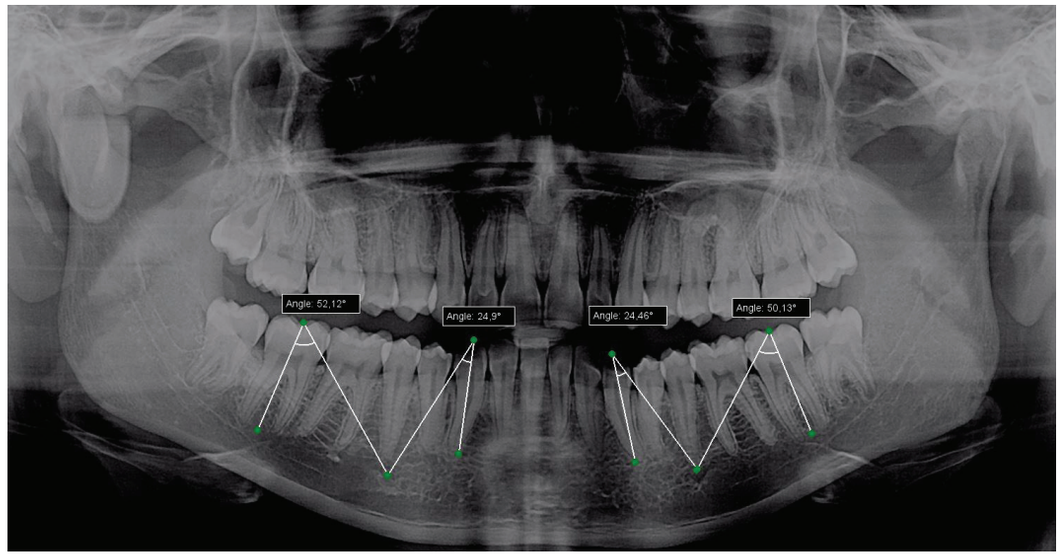

Figure 1. Measurement of the angulations of mandibular canines and second molars. Please note that the mental foramen was used as a common landmark for both teeth.

Statistical analyses:

We used SigmaPlot 12.5 (Systat Software Inc., San José, CA, USA) for statistical analyses. The data were first evaluated using the Shapiro–Wilk test. Because the data were normally distributed, we used a paired t-test to compare the measurements taken before and after extraction of one third molar. Statistical significance level was accepted as $p < .05$.

RESULTS

Angulation changes in the mandibular canines and second molars were observed. On the non-extraction side, the second molars and the canines showed uprighting movement (Table 1); however, the difference in angulation was significant only in the second molars. On the extraction side, differences were observed in the angulation of the second molars and canines showed uprighting movement (Table 2); however, these differences were not significant.

Table 1. First and second angulations of the mandibular canines and second molars on the non-extraction sides.

Tooth	Mean angulation, first radiograph	Mean angulation, second radiograph	p value
Canine	24.25 ± 4.08	25.56 ± 5.84	0.07
2nd molar	57.64 ± 7.91	56.29 ± 7.09	0.03

Table 2. First and second angulations of the mandibular canines and second molars on the extraction sides.

Tooth	Mean angulation, first radiograph	Mean angulation, second radiograph	p value
Canine	23.14 ± 4.80	23.66 ± 5.30	0.31
2nd molar	56.04 ± 6.28	55.34 ± 6.71	0.19

DISCUSSION

Dental crowding can be defined as the difference between the total mesiodistal distance of the teeth and the available space in the dental arch. This type of crowding can have a genetic basis or can develop later in life, especially after the third molars start to erupt, which is termed “late anterior crowding.”[2] Possible causes of the movement are mesial eruption of teeth, functional use of the teeth and masticatory forces.[13] Some authors have claimed that third molars can force the teeth anteriorly and contribute

to crowding.[14,15] They reported a strong relationship between the angulation of the third molars and mandibular dental arch crowding.[16] The increase in crowding during the third molar eruption period supports this belief.[17] Late mandibular anterior crowding is encountered less frequently in the absence of third molars.[7]

In contrast, other authors could not find any evidence supporting this idea.[18-21] Furthermore, in the cases of anterior crowding, extracting the third molars did not alleviate the problem, and third molar extraction is not necessary to prevent crowding.[19,20] Harris[22] advocated that the main reason for late anterior crowding is masticatory forces, not eruption of the third molars.

With changes in the teeth with age, the length of the dental arch begins to decrease, and irregularities occur at the incisors.[23,24] Bishara *et al*.[25] evaluated changes in the mandibular incisor teeth between the ages of 12 and 25 years and reassessed the same patients at the age of 45 years. They found an increasing inconsistency between dental arch length and tooth size with age. The mean dental arch length reduction from 12 to 25 years was 2.7 mm in males and 3.5 mm in females. Therefore, dental crowding increases as the dental arch length is reduced.[14]

However, in a systematic review by Zawawi and Melis[26], it was reported that the presence of third molar teeth did not have a significant effect on the crowding of the anterior teeth. Furthermore, in the prevention of post-orthodontic relapse or anterior teeth crowding, mandibular third molar extraction was not supported by studies that investigated the relationship between these two variables.

We aimed to understand the effect of mandibular third molars on the angulation of second molars and canines. We did not study the mandibular central or lateral teeth because they are frequently distorted in panoramic radiographs, which makes accurate measurement of their angulation almost impossible. Due to the compression effect of the mandibular third molars, mesial tipping of the mandibular second molars and canines in their long axes might be expected; however, in contrast, we observed uprighting. Although the mandibular second molars and canines were uprighted in their long axes, they may have migrated mesially. The limited number of patients and the short follow-up period were limitations of this study.

To ensure standardization, we included only the vertically positioned third molars; however, differently angulated teeth could also exert diverse effects. In fact, some authors asserted that only impacted third molars can cause anterior crowding, and a properly erupted third molar is unlikely to cause such a problem.[11]

The uprighting movement of the mandibular second molars was statistically significant in our study. In addition, there was uprighting movement in the canines that was not statistically significant. It may be speculated that, after prolonged follow-up, this difference would increase further.

Uprighting movement was observed on the non-extraction side and the mandibular third molars were expected to affect the anterior teeth tipping. This observation appears to conflict with the occurrence of anterior crowding. However, the dentition may have migrated mesially. Our findings suggest that this migration may have led to tooth uprighting rather than tipping.

CONCLUSION

In conclusion, it was determined that mandibular teeth are progressively uprighting. Keeping the mandibular third molars not extracted do increase the uprighting effect on the second mandibular molars; this effect might be transferred to teeth located anteriorly by time.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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