Odovtos-International Journal of Dental Sciences (Odovtos-Int. J. Dent. Sc.) 28 (2), 2026 (May-August): 279-285. SSN: 2215-3411
https://doi.org/10.15517/m1pyas52

ODOVTOS
International Journal of Dental Sciences

UNIVERSIDAD DE COSTA RICA
FOd Facultad de Odontología

https://revistas.ucr.ac.cr/index.php/rOdontos

CLINICAL RESEARCH:

Effect of Mandibular Third Molars on Anterior Crowding Assessed by CBCT

Evaluación mediante CBCT del efecto de los terceros molares mandibulares en el apiñamiento anterior

Fatmanur Ketenci Çay DDS, PhD[1] https://orcid.org/0000-0002-9618-1082
Büşra Gül Yılmaz DDS[2] https://orcid.org/0009-0006-7316-6708
Elif Çiğdem Keleş PhD[3] https://orcid.org/0000-0002-2479-1236
Dilhan İlgüy DDS, PhD[1] https://orcid.org/0000-0003-2050-3425

[1]Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Yeditepe University, Istanbul, Turkey.
[2]Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, University of Health Sciences, Istanbul, Turkey.
[3]Department of Biostatistics and Medical Informatics, Faculty of Medicine, Yeditepe University, Istanbul, Turkey.

Correspondence to: Fatmanur Ketenci Çay - fatmanur.ketenci@yeditepe.edu.tr

Received: 2-V-2025 Accepted: 21-VIII-2025

ABSTRACT: The role of mandibular third molars in the development of anterior dental crowding has long been debated, with conflicting evidence regarding their contribution. This study aimed to evaluate the effect of presence and angulation of mandibular third molars on anterior dental crowding. This study employed 138 cone-beam computed tomography scans and Little's Irregularity Index to explore the relationship between mandibular third molars and anterior dental crowding. The CBCT scans were categorized based on the third molars' status as impacted, erupted, or absent. Moreover, impacted teeth were classified using Winter's classification.The analysis revealed no statistically significant relationship between the presence or angulation of third molars and the severity of anterior dental crowding. These findings suggested that other factors rather than mandibular third molars may also be effective in anterior dental crowding. The results contribute to the ongoing debate by suggesting that third molars may not be the primary determinant of anterior crowding, emphasizing the need for more comprehensive research to clarify their role and the necessity of their prophylactic removal.

KEYWORDS: Molar third; Crowding; Index; Tomography; Measure; Tooth extraction; Orthodontics.

RESUMEN: El papel de los terceros molares mandibulares en el desarrollo del apiñamiento dental anterior ha sido objeto de debate durante mucho tiempo, con evidencia contradictoria sobre su contribución. Este estudio tuvo como objetivo evaluar el efecto de la presencia y la angulación de los terceros molares mandibulares en el apiñamiento dental anterior. Se utilizaron 138 tomografías computarizadas de haz cónico (CBCT) y el Índice de Irregularidad de Little para analizar la relación entre los terceros molares mandibulares y el apiñamiento dental anterior. Las CBCT se categorizaron según el estado de los terceros molares como impactados, erupcionados o ausentes. Además, los dientes impactados se clasificaron según la clasificación de Winter. El análisis no reveló una relación estadísticamente significativa entre la presencia o angulación de los terceros molares y la gravedad del apiñamiento dental anterior. Estos hallazgos sugieren que otros factores, además de los terceros molares mandibulares, también pueden influir en el apiñamiento dental anterior. Los resultados contribuyen al debate actual al indicar que los terceros molares podrían no ser el factor determinante principal del apiñamiento anterior, lo que subraya la necesidad de investigaciones más exhaustivas para aclarar su papel y la necesidad de su extracción profiláctica.

PALABRAS CLAVE: Tercer molar mandibular; Apiñamiento dental; Tomografía computarizada de haz cónico; Angulación dental; Ortodoncia; Índice de irregularidad.

INTRODUCTION

Malocclusion is a type of abnormality in dentition. Malocclusion can result from various underlying causes and is not solely attributable to dental factors. Any disruption in skeletal structure or soft tissue integrity can contribute to malocclusion. A specific example of malocclusion is tooth overcrowding. Crowding refers to the misalignment of teeth within the same dental arch (1).

Crowding obstructs effective interdental cleaning and plaque control, ultimately compromising periodontal health. As a result, many individuals with crowding exhibit poor oral hygiene, leading to plaque accumulation and subsequent periodontal disease, often beginning with gingival inflammation (2) and can lead to tooth loss if left untreated.

The relationship between mandibular anterior teeth crowding and third molars has been a topic without consensus for many years. There are two main theories regarding the influence of third molars on incisor crowding: The first theory states that mandibular third molars create an anterior component of force, leading to crowding in the anterior region. The second theory proposes that the force generated by third molars is inadequate to cause anterior crowding (3).

In the literature, numerous studies evaluated dental crowding using stone casts and panoramic radiographs (4-11). Some of these studies (4,7,10) found a positive association between mandibular third molars and lower anterior crowding, while others (5,6,8) did not find the same relationship. On the other hand, there are a few studies that have assessed crowding through Cone Beam Computed Tomography (CBCT) (1,12,13). They reported the positive effect of mandibular third molars on the lower anterior crowding, but the sample sizes are quite low in these studies.

Given the limited number of studies using CBCT, the low sample sizes, and the fact that the effect of the third molars on anterior crowding has not yet been clarified, this study aimed to evaluate the effect of third molars on anterior dental crowding using CBCT with a larger sample.

MATERIALS AND METHODS

The study design was authorized by the Non-Interventional Clinical Research Ethics Committee of Yeditepe University (decision date and number: 14.02.2025/E.83321821-805.02.03-579). The study was conducted following the regulations of the Declaration of Helsinki.

The CBCT images used in this study were randomly selected from the archives of the Faculty of Dentistry at Yeditepe University between 2020 and 2022. The I-CAT tomographic device (by KaVo, USA) was used to obtain tomographic images.

The inclusion criteria were as follows:

- CBCT images of patients older than 18 years old.
- CBCT images with the presence of all the permanent dentition except of wisdom teeth.
- Patients who have not had orthodontic treatment before.

The exclusion criteria were as follows:

- Presence of impacted teeth except of wisdom teeth.
- Presence of supernumerary teeth.
- Presence of any pathology such as cyst or tumor.
- Presence of deciduous teeth.

The sample size for this study was calculated using the G*Power 3.1.9.2 software. A sample size of 138 was determined, ensuring 90% power and a 5% Type I error rate. A total of 138 patients' tomographic images were examined, consisting of 81 females (58.7%) and 57 males (41.3%), ranging from 18 to 54 years, with a mean age of 29.71. These images were analyzed using the InVivo 5 software (CA, USA) by a dental radiologist with ten years of experience.

The images were grouped into three categories: impacted third molars, erupted third molars, and the absence of third molars. Additionally, impacted third molars were further categorized based on their orientation as vertical, horizontal and mesioangular. The images were evaluated in axial section, where the linear displacement between the anatomical anterior tooth contacts was measured (Figure 1) and the amount of crowding was calculated using Little's irregularity index. The index consisted of the following scores:

- 0: Perfect alignment
- 1-3: Minimal irregularity
- 4-6: Moderate irregularity
- 7-9: Severe irregularity
- 10: Very severe irregularity

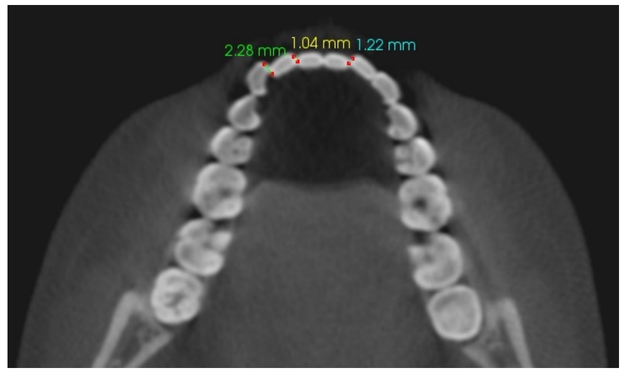

Figure 1. Analysis of Little's Irregularity Index using the axial section of CBCT.

Statistical analyses were performed using SPSS software version 28.0 (Statistical Package for Social Sciences). Descriptive analyses were presented as means and standard deviations for continuous data, while frequencies and percentages were used for categorical data. The Fisher-Freeman-Halton Exact test was used to compare categorical variables between groups. p-value of <0.05 was considered statistically significant.

RESULTS

The CBCT scans were classified into three categories depending on the presence and type of third molar impaction. The classification was as follows: unilateral impaction (62.3%, n=86), bilateral impaction (33.3%, n=46), and no impaction (4.3%, n=6). To further classify the impacted third molars, Winter's classification was utilized. The impactions were categorized as vertical (40.6%, n=56), horizontal (23.9%, n=33), mesioangular (25.4%, n=35), distoangular (5.8%, n=8), and no third molar present (4.3%, n=6). The Little's index classification of the sample was as follows: perfect alignment (2.9%, n=4), mild irregularity (21.7%, n=30), moderate irregularity (29.7%, n=41), severe irregularity (28.3%, n=39), and very severe irregularity (17.4%, n=24). The mean and standard deviation of the sample's crowding were 5.67 ± 3.16.

No statistically significant difference was found between Little's Index and gender distribution ($p>0.05$) (Table 1). Similarly, no statistically significant difference was found between Winter's classification and gender distribution ($p>0.05$) (Table 2). Additionally, no statistically significant difference was found between Little's Index and the distribution of impaction ($p>0.05$) (Table 3).

Table 1. Little index-gender crosstabulation.

	Gender						
	Female		Male			Total	
Little index	**Count**	**% Within little index**	**Count**	**% Within little index**	**P value**	**Count**	**% Within little index**
Perfect alignment	3	75.0%	1	25.0%	0.539	4	2.9%
Mild irregularity	20	66.7%	10	33.3%		30	21.7%
Moderate irregularity	26	63.4%	15	36.6%		41	29.7%
Severe irregularity	20	51.3%	19	48.7%		39	28.3%
Very severe irregularity	12	50.0%	12	50.0%		24	17.4%
Total	81	58.7%	57	41.3%		138	100.0%

Table 2. Winter type-gender crosstabulation.

	Gender						
	Female		Male			Total	
Winter Type	**Count**	**% Within winter type**	**Count**	**% Within winter type**	**P value**	**Count**	**% Within winter type**
Vertical	36	64.3%	20	35.7%	0.402	56	40.6%
Horizontal	18	54.5%	15	45.5%		33	23.9%
Mezioangular	19	54.3%	16	45.7%		35	25.4%
Distoangular	3	37.5%	5	62.5%		8	5.8%
Absent	5	83.3%	1	16.7%		6	4.35%
Total	81	58.7%	57	41.3%		138	100.0%

Table 3. Little's index-impaction crosstabulation.

	Impaction								
	Unilateral		Bilateral		No impaction			Total	
Little index	**Count**	**% Within little index**	**Count**	**% Within little index**	**Count**	**% Within little index**	**P value**	**Count**	**% Within little index**
Perfect alignment	3	75.0%	1	25.0%	0	0.0%	0.354	4	2.9%
Mild irregularity	17	56.7%	12	40.0%	1	3.3%		30	21.7%
Moderate irregularity	22	53.7%	18	43.9%	1	2.4%		41	29.7%
Severe irregularity	29	74.4%	7	17.9%	3	7.7%		39	28.3%
Very severe irregularity	15	62.5%	8	33.3%	1	4.2%		24	17.4%
Total	86	62.3%	46	33.3%	6	4.3%		138	100.0%

DISCUSSION

The relationship between mandibular third molars and anterior dental crowding has been debated for several years. Despite numerous studies, the evidence remains inconclusive, with some researchers (4,7,10) suggesting that third molars play a significant role in crowding, while others (5,6,8) argue against such an association.

Several studies, including the systematic review by Palikarakia *et al*. (3), evaluated the role of mandibular third molars in causing anterior crowding in both treated and untreated patients. Their findings indicated that the presence of mandibular third molars may contribute to crowding, particularly in cases where orthodontic treatment has not been performed. Their meta-analysis further highlighted that patients without third molars experienced less crowding compared to those with third molars, as measured using Little's irregularity index.

Similarly, the study by Selmani *et al*. (10) found that the Ganss ratio, which measures the relationship between the retromolar space and the width of the mandibular third molar crown, was significantly reduced in individuals with crowding compared to those without crowding. This study provided further evidence suggesting that reduced space in the dental arch due to third molars may influence the degree of crowding. However, their study used panoramic radiographs and study models, whereas the present study utilized CBCT, which is considered the gold standard. This may be the reason for the differences in findings between these two studies.

Moreover, Husain and Rengalakshmi (1) used CBCT data as in our study, but unlike the present study, they reported a positive correlation between the presence of mandibular third molars and increased crowding in the mandibular anterior segment. Their study demonstrated that individuals with third molars had significantly higher crowding scores, suggesting that the presence of third molars may contribute to anterior crowding. This discrepancy may be attributed to the relatively small sample size in their study.

Conversely, Cotrin *et al*. (8) argued that third molars do not play a significant role in the anterior crowding relapse in orthodontically treated patients. Their study, which evaluated the relapse of mandibular anterior crowding following the retention phase, found no statistically significant difference between the patients with third molars and those without, which aligns with the findings of the present study.

Additionally, Demyati *et al*. (11) conducted a study using panoramic radiographs and study casts. As in the present study, they focused on the angulation of impacted third molars and its potential influence on crowding severity. Similar to ours, their findings indicated no significant relationship between the angulation of third molars and the degree of anterior crowding. They concluded that while third molars may contribute to crowding, their orientation may not be a determining factor, and other variables such as arch length and individual growth patterns may have a greater influence.

CONCLUSION

Based on the findings of this study, no significant relationship was found between the presence or position of third molars and the degree of anterior crowding. This may be due to the multifactorial nature of the crowding, suggesting that third molars may not be the primary cause, as noted in several studies (8,10,11).

In the future, the ambiguous relationship between tooth crowding and third molars may be clarified by further CBCT studies using larger samples and investigating etiological factors other than third molars, thus providing more definitive conclusions regarding the necessity of prophylactic third molar removal.

AUTHOR CONTRIBUTION STATEMENT: Conceptualization and design: F.K.Ç.; Literature review: F.K.Ç. and B.G.Y.; Methodology and validation: F.K.Ç.; Formal analysis: F.K.Ç.; Investigation and data collection: F.K.Ç.; Resources: F.K.Ç. and B.G.Y.; Data analysis and interpretation: E.Ç.K.; Writing-original draft preparation: .FK.Ç. and B.G.Y.; Writing-review and editing: F.K.Ç., B.G.Y. and D.İ.; Supervision: D.İ.; Project Administration, F.K.Ç. and D.İ.

ETHICAL APPROVAL: This study was approved by the Non-Interventional Clinical Research Ethics Committee of Yeditepe University (decision date and number: 14.02.2025/ E.83321821-805.02.03-579) and was conducted in accordance with the Declaration of Helsinki.

INFORMED CONSENT: Informed consent was obtained from patients. CBCT images were anonymized, and no identifiable patient data were used.

CONFLICT OF INTEREST: The authors declare no conflict of interest.

FUNDING: No financial support was received for this study.

REFERENCES

1. Husain S., Rengalakshmi S. Correlation between mandibular third molar and mandibular incisor crowding: A retrospective CBCT-based study. J Dent Res Dent Clin Dent Prospect. 2021; 15 (4): 247.
2. Raphael O.D. Periodontal status of patients with mandibular anterior crowding. Niger J Res Orofacial Infect Oncol. 2020; 3 (1): 1-6.
3. Palikaraki G., Mitsea A., Sifakakis I. Effect of mandibular third molars on crowding of mandibular teeth in patients with or without previous orthodontic treatment: a systematic review and meta-analysis. Angle Orthod. 2024; 94 (1): 122-132.
4. Abdulla E.H., Abdulazeez M.I., Hasan L.S. The relationship of the lower third molar to the anterior dental crowding. J Dent Res. 2014; 1 (2): 29-32.
5. Shah R.B., Kanzariya N., Goje S.K., Kulkarni N., Joshi H., Chellani S. Assessment of role of mandibular third molar position in lower anterior crowding: a cross-sectional study. J Integr Health Sci. 2018; 6 (2): 69-73.
6. Hasegawa Y., Terada K., Kageyama I., Tsuchimochi T., Ishikawa F., Nakahara S. Influence of third molar space on angulation and dental arch crowding. Odontology. 2013; 101: 22-28.

7. Selmani M.E., Gjorgova J., Selmani M.E., Shkreta M, Duci SB. Effects of lower third molar angulation and position on lower arch crowding. International journal of orthodontics (Milwaukee, Wis.) March. 2016.
8. Cotrin P., Freitas K.M.S., Freitas M.R., Valarelli F.P., Cançado R.H., Janson G. Evaluation of the influence of mandibular third molars on mandibular anterior crowding relapse. Acta Odontol Scand. 2020; 78 (4): 297-302.
9. Cherian M., Ravi M.S. Lower third molar space and angulation in individuals with lower anterior crowding. J Health Allied Sci NU. 2016; 6 (3): 10-15.
10. Selmani M., Bukleta M.S., Duci S.B. The role of dental arch dimensions and impacted third molars on mandibular anterior segment crowding. Eur J Dent. 2024; 18 (4): 1164-1171.
11. Demyati A.K., Badgaish F.A., Alzahrani R.A., Alsehli R.O., Alnuayri S.A., Alqutub A.W., Ghandourah A.O. Assessment of the relationship between impacted mandibular third molars' angulation pattern and crowding severity: a cross-sectional study. Saudi Dent J. 2024; 36 (5): 789-794.
12. Haider O., Sharaf M.A., Abdulqader A.A., Alhashimi N., Sharhan H.M., Chen C., et al. Three-dimensional relationship between the degree of bilateral impacted mandibular third molars angulation and the mandibular dental arch parameters: a cross-sectional comparative study. Clin Oral Investig. 2023; 27 (8): 4301-4311.
13. Devi A., Mushtaq M. Assessment of effect of third molars on lower anterior crowding. J Adv Med Dent Scie Res. 2022; 10 (10): 64-66.