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REVIEWS

The Evolution of Third Molars in Orthodontics: what about Anterior Dental Crowding? Systematic Review

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ABSTRACT

Background: Third molar influence on anterior crowding is controversial. However, it is assumed that they play a significant role in compromising dental arch space.

Aim: To review the literature to clarify the role of third molars in anterior crowding and relapse after orthodontic treatment using a systematic review

Material and methods: A systematic search was conducted based on an electronic search of several databases (Pub Med, Science Direct, Cochrane Library) covering publications from 2010 to January 2022. The search was performed using the acronym PICOS, limited to the following keywords in English and French: «wisdom tooth» OR« third molar »AND «anterior teeth crowding.»

Results: Based on the keywords, 549 bibliographical references were initially identified. After the elimination of duplicate references and studies, the number of articles was reduced to 315. A review of titles and abstracts resulted in the selection of 23 articles. After reading the complete text, six articles were included in this systematic review

Conclusion: No relationship between the incisors crowding and the presence of third molars was identified. Therefore, the indication for prophylactic removal of third molars to avoid incisor crowding is not justified.

KEYWORDS: Third molar , Wisdom tooth , Anterior teeth crowding, Relapse

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INTRODUCTION

The third molars are the last permanent teeth on the dental arch. Their eruption takes place late, at the end of growth. These teeth are helpful in the anatomical, functional, and dynamic balance of the dental arches, particularly in masticatory function and maintenance of the vertical dimension.

In orthodontics, the most controversial role of the third molars is whether they can contribute to the development of malocclusion or relapse after orthodontic treatment, particularly in the anterior segment of the dental arch. Several studies have reported conflicting results.[1]

This work aims to review the articles published on the topic to clarify the role of third molars on anterior teeth crowding and relapse after orthodontic treatment, and this through a systematic review.

MATERIALS AND METHODS

Research strategy: A systematic search was conducted based on an electronic search of several databases (Pub Med, Science Direct, Cochrane Library) covering publications from 2010 to January 2022. The search was performed using the acronym PICOS and limited to the following keywords in English and French: «wisdom tooth» OR« third molar »AND «teeth crowding.»

Table 1: Question PICO

Population	Patients with anterior dental crowding
Intervention	Third molars removal
Comparaison	Anterior Crowding in patients with or without third molars removal
Out come	The causality of the evolution of third molars in anterior dental crowding
Studies	Comparative studies: clinical trials, retrospective studies, cohort studies…

Selection criteria:

Inclusion criteria:

- Articles published from 2010 to January 2022
- Full text accessible
- Articles published in English or French
- Original article, prospective, retrospective, longitudinal or cross-sectional studies, cohort study, case-control study, randomized control trials
- studies with human subjects only
- Studies evaluating the impact of the third molar on dental arch alignment
- Studies evaluating the relapse of anterior dental crowding after an orthodontic treatment without third molar removal

Exclusion criteria:

- A Case report
- Literature revues
- Studies including the only patient who has been removed third molars

Studies with unclear outcomes of interest

-Quality assessment:

- The selected articles were scored based on the proposed criteria "National Institutes of Health, Department of Health and Human Services, USA [2]. The risk of bias in studies was assessed independently by the authors. Any disagreement was resolved by discussion with the examiner. Among the criteria used by these authors, we find sample randomization, comparison between the effects of the intervention, validation of measures, inclusion and exclusion criteria, and statistical analysis. Regarding the risk of bias for each study analyzed, the documents containing all the above-mentioned points (9-13) were rated as "low risk," those for which the number of points in between (6-8) were rated as "medium risk," a "high risk "is assigned to studies that meet or less than five criteria. (table 2). The six studies included in our review present a low risk of bias .

Table 2: Quality criteria of included studies

Quality assessement	Cortin P and al 2019	Esan T and al 2017	Stanaityte and al 2014	Hasegawa and al 2013	Karasawa and al 2013	Cuoghi and al 2010
Research question	Yes	Yes	Yes	Yes	Yes	Yes
Study population	Yes	Yes	Yes	Yes	Yes	Yes
Groups recruited from the same population and uniform eligibility criteria	Yes	Yes	Yes	Yes	Yes	Yes
Justification of sample size	No	No	No	No	No	No
Exposure assessed before measurement of results	Yes	Yes	Yes	Yes	Yes	Yes
Sufficient time to see an effect	Yes	Yes	Yes	Yes	Yes	Yes
Different exposure levels of interest	NA	NA	NA	NA	NA	NA
Exposure measurements and assessment	Yes	Yes	Yes	Yes	Yes	Yes
Repeated exposure assessment	Yes	Yes	Yes	Yes	Yes	Yes
Outcome measures	Yes	Yes	Yes	Yes	Yes	Yes
Blinding of exposure assessors	NA	NA	NA	NA	NA	NA
Follow-up rate	No	No	No	No	No	No
Statistical analysis	Yes	Yes	Yes	Yes	Yes	Yes
Results	9	9	9	9	9	9

RESULTS

Based on the keywords, 549 bibliographical references were initially identified. After the elimination of duplicate references and studies, the number of articles was reduced to 315. A review of titles and abstracts resulted in the selection of 23 articles. After reading the complete text, six articles were included in this systematic review. (table 3)

DISCUSSION

Relapse of anterior crowding is a phenomenon that frightens orthodontists following orthodontic treatment and inevitably occurs in most treated cases.

The claim that the 3rd molars are the main cause of this relapse is still widespread among patients and practitioners, sometimes leading to their prophylactic removal.

Several authors have been interested in the causes of relapse following orthodontic treatment, especially due to the wisdom tooth, which remains a subject of controversy. [9]

In most studies, dental crowding was determined using Little's (1975) irregularity index. This index represents the linear displacement of each incisor's anatomical contact points (as distinguished from the clinical contact points) of the adjacent tooth's anatomical contact point. The sum of these five displacements represents the relative degree of anterior irregularity. An index score of 0–0.9 mm is ideal, between 1–3.9 mm is considered minimal, between 4–6.9 mm is moderate, from 7–9.9 mm is severe and a score of more than 10 mm is extreme [10]. Notably, Cortin et al. in 2019[3], Stanaityte et al. in 2014 [5] and Hasgow et al. in 2013 [6] all opted for the Little irregularity index for the measurement of dental crowding. All reported that there is no statistically significant difference in incisor crowding relapse in the two groups of patients (with and without wisdom tooth extractions), thus corroborating the results found by Bruschang et al. in 2003[10], Lidauer et al. in 2007 [11]and recently,Genest-Beucher in 2018[12]. They concluded through their literature review that 83% of

articles did not find any significant relationship between the presence of third molars and anterior teeth crowding. Likewise, the study by Esan T et al. in 2017 [4] reported no statistically significant difference in Little irregularity index comparison when third molars have completely erupted in the evaluated stages and periods. In other words, the amount of relapse after the retention period was similar between the groups with and without third molars. These results show that relapse occurs regardless of third molars presence or absence. This result agrees with the study done by Okazaki et al. in 2010[13], who investigated interproximal force change in the anterior teeth of the lower jaw and the effect of the erupting third molars in 40 treated patients. He followed them for 18 months during the retention phase. His finding also revealed that the erupting third molar did not affect the total interproximal. However, Esan T et al. in 2017 [4] also mentioned in their study that there is a statistically significant correlation between the inclusion of wisdom teeth and dental crowding, and Karasawa et al. in 2013 [7] evaluated three hundred subjects with a mean age of 20.4 years on the presence or absence of wisdom teeth and incisor crowding. They also found no statistically significant association between the presence of upper and/or lower third molars and anterior teeth crowding. Their conclusions stated that evidence on the role of third molars as an etiologic factor in the late lower arch crowding is lacking. Still, these results do not agree with those mentioned by Hasagowa. et al. in 2013[6] reported no significant correlation between the inclusion of wisdom teeth and anterior crowding.

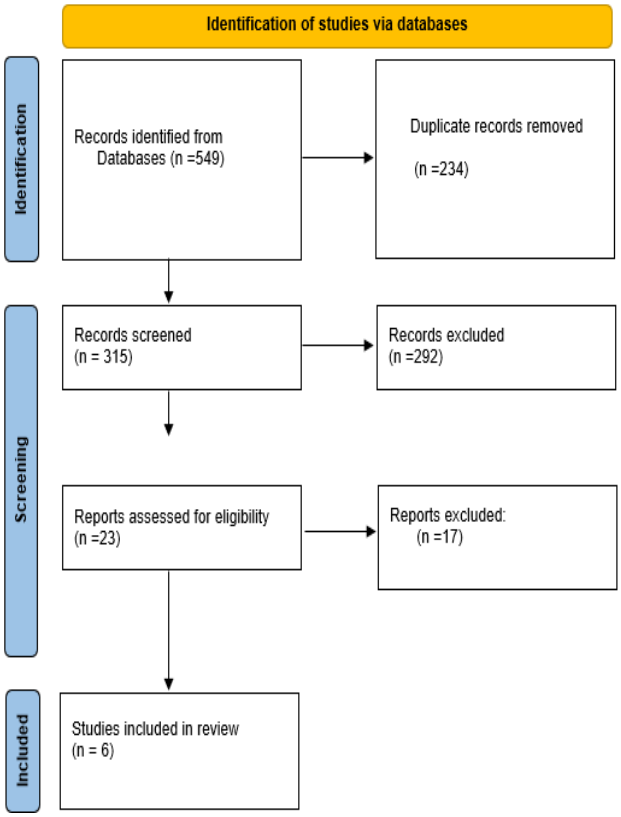

Figure 1: Flow diagram demonstrating literature search, study inclusion and exclusion

Table 3: results of studies

Study	Study design	objective	Patients	Methods	Results
cortin p and al 2019 [3]	Comparative retrospective study	To evaluate the influence of mandibular third molars on relapse of mandibular anterior crowding in orthodontically treated patients	108 patients: Group 1: 72 patients with third molars present in the postretention evaluation stage. Group 2: 36 patients who did not present the third molars in the postretention evaluation stage. -Mean age : 20,67+/-1,3	-Panoramic radiographs and dental models were evaluated at three different stages: pre-treatment; posttreatment and postretention. -anterior crowding was measured by the Little Irregularity Index.	No statistically significant difference in the relapse of mandibular anterior crowding among the groups with and without mandibular third molars at the postretention stage.
Esan T and al 2017 [4]	Retrospective cross-sectional study	To evaluate the relationship among third molar's impaction or agenesis and crowding theeth	535 patients In the mandible: (439 patients present erupted wisdom teeth ,37 agenesis, 59 impacted) In the maxilla: (458 patients present erupted wisdom teeth , 49 agenesis, 12 included) - average age: 43.6 +/- 12	-Presence / absence of wisdom teeth: Panoramic x-rays (before, in progress and after orthodontic treatment) - Measurement of teeth crowding: Little irregularity index	Statistically significant correlation between inclusion of wisdom teeth and dental crowding -the wisdom teeth having completed their eruption do not cause dental crowding -the agenesis of a wisdom tooth does not explain the absence of crowding
stanaityte and al 2014 [5]	Prospective Study (6–8 months)	-To evaluate the effect of the extraction of wisdom teeth on the mandibular arch	-30 patients who had bilateral wisdom tooth extraction -Average age 25.5 (16.2–55.1)	-Presence / absence of wisdom teeth: Panoramic X-rays (before, in progress and after orthodontic treatment) - Measurement of crowding by: Little irregularity index	No significant difference before and after extraction of wisdom teeth
Hasegawa and al 2014 [6]	Descriptive cross-sectional study	To evaluate the effect of impacted wisdom teeth on dental crowding	-34 patients with impacted wisdom teeth -Average age 21.0 (18.3–24.1)	-Presence / absence of wisdom teeth: Panoramic X-rays (before, in progress and after orthodontic treatment) - Measurement of crowding by : Little irregularity index -angulation of wisdom teeth by: Ganss index	No significant correlation between inclusion of wisdom teeth and dental crowding.
Karasawa and al 2013 [7]	Descriptive cross-sectional study	To evaluate the relationship between lower wisdom teeth and anterior dental crowding	-300 patients : 54 agenesic wisdom teeth 92 extracted 5 incompletely erupted 91 completely erupted 58 impacted - average age: 20.5 (+/- 2.4)	- Presence / absence of wisdom teeth: Panoramic x-rays (before, during and after orthodontic treatment)	The presence of maxillary and / or mandibular wisdom teeth does not show any correlation with lower incisor crowding
Cuoghi and al 2010 [8]	Comparative cross-sectional study	To compare the change in the mesiodistal angulation of the canines, premolars and molars in two groups of patients (with and without wisdom tooth extractions)	-40 patients (20 with impacted third molars and 20 with extracted third molars) -Average age 22.35	- Presence / absence of wisdom teeth: Panoramic x-rays (before, during and after orthodontic treatment) -comparing mesiodistal angulation of the of the canines, premolars and molars in the two groups	No significant difference in the two groups of patients with and without wisdom tooth extraction

This discrepancy in results can be explained by the differing work methodology, sample size, and the orientation and degree of inclusion of the wisdom teeth. Therefore, we can say that third molars do not cause tooth crowding, as there is always more than one factor influencing it. Wisdom teeth are only one of many factors that may cause crowding.

In orthodontics, the extraction of wisdom teeth is indicated in cases of posterior crowding and distalization of the arch or when their unfavourable orientation compromises the stability of the arch. Therefore, it is not justified or recommended to have wisdom teeth extracted, whether impacted or not, for the sole purpose of preventing the occurrence of dental overlap [14].

CONCLUSION

The results of our work elucidated that there is no relationship between incisor crowding and the presence of third molars. Thus, we can suggest that prophylactic removal indication of the third molars to avoid incisors crowding is not justified.

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AUTHORS' CONTRIBUTIONS

The participation of each author corresponds to the criteria of authorship and contributorship emphasized in the Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals of the International Committee of Medical Journal Editors. Indeed, all the authors have actively participated in the redaction, the revision of the manuscript, and provided approval for this final revised version.

COMPETING INTERESTS

The authors declare no competing interests with this case.

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