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Literature Review

Consideration of Mandibular Third Molar Extraction for Post-Orthodontic Relapse Prevention

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ABSTRACT

Background: Orthodontic treatment may result in undesired teeth movement which is called "relapse". One of the factors thought to influence post-orthodontic treatment relapse is the third molar, especially mandibular third molar it's because third molar eruption and mandibular anterior crowding occur simultaneously. The extraction of this teeth can be suitable prevention of tooth relapse after orthodontic treatment **Purpose:** This study aimed to describe whether there is an effect of mandibular third molar extraction on relapse in post-orthodontic treatment crowding cases so that it can determine whether this action can be a preventive solution in these cases. **Review:** This review was conducted by studying total 11 journals (n = 2/11) mentioned that there was third molar relation to the anterior crowding teeth and most likely recommended its extraction to prevent relapse post- orthodontic treatment. Meanwhile (n = 8 / 11) did not agree with the statement, and (n = 1/11) is still undetermined. **Conclusion:** Extraction of the mandibular third molar can prevent crowding relapse, in case of impaction it must be extracted, and this extraction can be performed before, during, or after orthodontic treatment.

Keywords: dentistry; medicine; odontectomy; tooth relapse; orthodontics

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INTRODUCTION

Orthodontic treatment is a treatment in dentistry that aims to treat malocclusion.[1] This treatment will result change of teeth position, where the desired position change is called "settling of the occlusion", while the undesired is called "relapse".[2] According to a study conducted in Indonesia, the prevalence of relapse post-orthodontic treatment was 70.83%, of which 50% relapse was seen in retainer users for 2 years, 28% relapse occurred in retainer users for 2-5 years, and 12% relapse occurred. on retainer users for 5-10 years.[3]

One of the factors thought to influence the post-orthodontic treatment relapse is the third molar, because its eruption and mandibular anterior crowding occur simultaneously so extraction of this teeth can be suitable prevention to reduce crowding. In various populations, the incidence of impaction is 9.5% to 68%.[4] and approximately 65% of the human population has at least one impacted third molar by the age of 20 years.[5] It is suspected that impacted third molars put pressure on the anterior teeth to crowd.[6]

Third molar anomaly probably related to the smaller jaw size over time. The decrease in mandibular size occurs due to decreased human dependence on teeth[5]. Evolution of the teeth is slower than evolution of the jaw so that they are crowded. This review will discuss about mandibular third molar extraction influence on post-orthodontic treatment crowding relapse. Mandibular third molar was chosen because of its controversial role in orthodontic treatment and this tooth is often anomalous. Thus, this study aimed to describe whether there is an effect of mandibular third molar extraction on relapse in post-orthodontic treatment crowding cases so that it can determine whether this action can be a preventive solution in these cases.

REVIEW

The summary of literature review that used in this study showed in Table 1.

DISCUSSION

Third molar extraction is the most controversial extraction. In the orthodontics field, it is still questionable whether third molars contribute to crowding or relapse post- orthodontic treatment, especially in the anterior segment of the dental arch. The hypothesis was that the mesial component of the erupted third molar was transmitted through the dental arch, capable of causing mesial migration of the teeth culminating in the incisor area. The result is loss of available space and crowding.[18]

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Table 1. The summary of literature review that used in this study.

Citation	Objective	Methods	Result
Sheneman[7]	Study the effect of mandibular third molar toward anterior mandibular teeth	Dental cast and lateral cephalometric analysis from 49 post-orthodontic treatment cases with eruption, impacted, or agenesis mandibular third molar	Case with agenesis mandibular third molar relatively more stable
Kaplan[8]	Knowing effect of mandibular third molar presence toward anterior crowding, especially relapse post-orthodontic treatment	75 Caucasian post-retention patient (mean 9.3 out of retention; mean post-retention age 26.6 years) divided based on bilateral mandibular third molar : erupted, impacted, agenesis	There is no difference results between groups
Ades et al.[9]	Determine third molar relation toward mandibular arch changes	Dental casts and lateral cephalometric analysis in pre-treatment, post-treatment, ad post-retention; and categorized mandibular third molars as: erupted, impacted, agenesis, minimal 10 years extraction before post-retention record.	There are no difference results between groups and third molar extraction to prevent relapse is not justified.
Kahl-Nieke et al.[10]	Analyzing post-retention changes and reveal possible predictor factor for long time prognosis	226 post-orthodontic treatment cases' pre-treatments, post-treatment and post-retention record were taken to measure some aspects including third molar presence. Bilateral mandibular third molars divided as erupted or impacted, and agenesis or extracted	Mandibular third molars presence influence mandibular anterior crowding relapse and absence of the teeth significantly reducing relapse
van der Schoot et al.[11]	Determine crowding relation with presence of third molar.	Analyzing 99 patient pre-and post-orthodontic treatment, and at least three years after retention period. Divided according third molar condition: erupted, impacted, extracted, agenesis.	No relation between crowding and third molar presence or absence
Harradine et al.[12]	Investigate prophylactic mandibular third molar extraction in mandibular anterior crowding	77 post-orthodontic patients divided into : erupted and extracted (44, random)	There is no significant difference between groups and third molar extraction to prevent anterior crowding is not justified.
Little[13]	Finding presence or absence third molar toward dental arch alignment	Dental casts and lateral cephalmetry were taken and compared every interval (pre-treatment, post-treatment, post-retention)	There is no change in dental arch alignment
Al-Balkhi[14]	Investigate role of third molar toward mandibular anterior re-crowding with absence of tight interproximal contact.	32 post-orthodontic cases (age 14-19) who treated with four premolar extraction pasca ortodonti (usia 14-19 tahun) were taken OPG and a post-treatment cast was made. Hawley retainer is attached to the maxilla and no retainer in the mandible. The patient's condition had no mandibular anterior crowding.	There is no significant correlation between mandibular third molar against anterior re-crowding in the absence of a tight incisal interproximal relationship.
Al-Duliamy[15]	Treatment Objective : to maintan facial profile, and class I molar and canine, correcting maxilla and mandible crowding, deep bite, anterior and posterior crossbite, achieve ideal overjet and overbite, and good dentoalveolar changes.	Pasien is a 20 years-old Iraqi man with class I Angle malocclusion, severe crowding in two jaws, deep bite, and anterior and posterior crossbite. Tooth 28, 27, 37 were vertically impacted, and 28, 38, 48 were horizontally impacted. He was treated by non-extracted any erupted teeth, and extraction of impaction teeth in retention period to prevent post-orthodontic treatment relapse.	Impacted third molar extraction shown an increased of patient's dentofacial aesthetics. But, there is no here is no further information regarding its effect on relapse.

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Azeem et al.[16]	Determine Pakistani orthodontist about mandibular third molar relation and mandibular incisive relapse.	A hundred Pakistani orthodontist were asked their opinion about mandibular third molar relation and mandibular incisive relapse and the extraction to prevent that relapse.	Majority said that mandibular third molar does not contribute in anterior crowding relapse and do not reccomend extraction.
Cotrin et al.[17]	Evaluating mandibular third molar toward post-orthodontic treatment anterior crowding relapse.	108 cases in post-retention period were divided into: third molar presence (erupted and impacted), and third molar absence (extracted, and agenesis). Using three interval period analyzes (pre-treatment, post-treatment, post-retention)	There is no significant difference between groups

This review was conducted by studying total 11 journals. (n = 2/11) concluded that there was third molar relation to the anterior crowding teeth and most likely recommended its extraction to prevent relapse post- orthodontic treatment. Meanwhile (n = 8 / 11) did not agree with the statement, and (n = 1/11) is still undetermined. Previous study using a dental model and lateral cephalometric radiography 49 post-orthodontic cases with groups of patients teeth erupting to occlusion, impaction, and agenesis stated that patients with agenesis mandibular third molar showed a more stable outcome than patients with present third molars.[7] Contradictory, previous study conducted a study using dental models and lateral cephalometric radiographs (pre-treatment, post-treatment, and post-retention) of 75 Caucasian patients with malocclusion: 33 grade I Angle malocclusion, 36 Class II division 1, 6 class II division 2. Based on the condition of the bilateral mandibular third molars, they were grouped into: eruption to the occlusal plane, impaction, and agenesis. In this study, it was found that there was no effect of the mandibular third molar on the anterior crowding condition and there was no difference in results between the three groups. Statement which said that the third molar exerts pressure on the mesial tooth is not proven in this study. [8]

In 1990, a study was done to determine the relationship of third molars to changes in the mandibular arch using dental models and lateral cephalometry of 97 patients with erupted to functioning third molars, impacted, agenesis, and had been extracted for at least 10 years pre-recorded post-retention. The result was that there was no significant difference in outcome between the four groups (including the impaction extraction subgroup). Mandibular third molar extraction was not recommended to prevent mandibular anterior irregularity.[9]

There was a study conducted in the 226 patients to analyze post-retention changes. Previous study used a study model and lateral cephalometric radiography at three stages. The third molars were classified as either remaining (erupted or impacted) or missing (agenesis or extraction) teeth separately between the maxilla and mandible. It was found that the mandibular third molar affected the relapse of the mandibular anterior teeth. When the third molar is absent, the mandibular teeth show less crowding than when they are present. Mandibular crowding relapse occurs more frequently in patients with jaw constriction than in patients with minimal space or crowding. However, they stated that the clinical relevance of these findings is questionable.[10]

In 1997, a study was done to compare the effect of presence or absence of mandibular third molars. 99 patients were analyzed pre and post-orthodontic treatment and at least three years post- the retention period was completed and categorized based on eruption, impaction, extraction, agenesis. Outcome: presence or absence of third molars did not have a clinically important influence on the development of crowding post- orthodontic treatment and should not be used as a reason for relapse of crowding post- orthodontic treatment.[11]

A year later, there was a study performed a randomized trial of extraction of 44 out of a total of 77 patients who had undergone maxillary orthodontic treatment only with mandibular premolar extraction. All patients had a crowding third molar. Little's irregular index was used to calculate the mesiodistal width of the canines and the maxillary and mandibular arch widths ($p<0.15$). This study concludes that third molar extraction to prevent or reduce relapse is not justified.[12]

Another year, Little used a method similar to Sheneman, Kaplan, and Ades by collecting pre-treatment, post-treatment, post-retention records and then making lateral cephalometric models and radiographs. He divided third molars into several sub-groups: bilateral impacted, eruption, extraction, bilateral agenesis then the model and cephalometry were measured and compared each time interval. The result was that there was no difference in changes in mandibular arch alignment and stability among the four groups and extraction should preformed to treat another problem such as periodontal problems; not to aid stability in dental arch.[13]

In 2004, study on a model study of 32 patients aged 14-19 years and underwent extraction of 4 premolars post- orthodontic treatment. The difference with the previous study: every patient wear a Hawley retainer only on the maxilla. The cases were followed up for a year and orthopantomography (OPG) was taken for the retention stage. As a result, (n = 5/32) patients had a re-crowding and others had no crowding. There was no significant correlation between the condition of the mandibular third molars (erupted / missing / impacted with or without sufficient space) against the condition of overcrowding of the anterior teeth.[14] Moving on to case report using

maxillary and mandibular third molar extraction treatment as a means of preventing recurrence. In a report, Al-Duliamy (2015) treated a 20-year-old Iraqi male patient with Angle I malocclusion, severe dental crowding in the maxilla and mandible, deep, and anterior and posterior crosses. Some of the teeth were impacted: 18, 27, 37 (vertical impaction); 28, 38, 48 (horizontal impaction). Patient underwent orthodontic treatment without extraction of the erupted tooth, and impacted extraction surgery were performed during the retention phase to prevent relapse post-orthodontic treatment. Extraction of the impacted third molar resulted in a significant improvement in the occlusal relay of the patient's dentofacial esthetics but its effect on preventing crowding relapse still undetermined because the subject is still in retention period.[15] Meanwhile, a survey involved 100 orthodontists stated that 79% of people agreed there was no relationship of mandibular third molars to anterior crowding relapse; and 78% people disagree that mandibular third molar extraction can prevent relapse of crowding anterior teeth.[16]

Finally, in 2019, Cotrin et al divided 108 post-retention patients into two groups. The first group with the third molar still present (eruption or impaction), and the second group with the missing third molar (agenesis or extraction).[17] Then evaluation of panoramic radiographs and dental models at the pre-treatment stage; post-treatment; post-retention. Deep bites and mandibular anterior crowding were sized using the Little Irregularity Index. T-tests and multifactorial regression analysis were used to compare results between groups. As a result, there was no significant difference in mandibular anterior crowding relapse between groups with and without mandibular third molars.[18] This study result only limited on narrative review, however, systematic review or clinical study should be conducted to investigate the consideration of third molar odontectomy to prevent orthodontic relapse.

CONCLUSION

From 11 literatures review, it can be concluded that extraction of the mandibular third molar can prevent crowding relapse, in case of impaction it must be extracted, and this extraction can be performed before, during, or after orthodontic treatment. However, clinical study with good setting and design should be done to examine the exact effect of third molar odontectomy for orthodontics relaps prevention.

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