Journal of Research in Medical and Dental Science
2021, Volume 9, Issue 9, Page No: 160-165

Available Online at: www.jrmds.in
eISSN No.2347-2367: pISSN No.2347-2545

The Relationship of Mandibular Wisdom Tooth Within the Crowding of Lower Anterior Teeth–A Literature Review

Ruba J Mohammad*

Department of Orthodontics, Peadodontics and Preventive Dentistry, College of Dentistry, University of Mosul, Iraq

ABSTRACT

The late lower incisors crowding that develops or increases in the adolescent period or after orthodontic treatment, considered a common clinical problem. The role of erupting third molars as a cause of dental crowding has been the subject of discussion over the years because they occur simultaneously. The relationship between erupting third molars and late anterior crowding is suggested by several authors, while others state that there is no definite relationship. Accordingly, this review was aimed to identify the literature related to the effect of the mandibular third molars on the lower anterior crowding.

Key words: Incisors dental crowding, Impacted tooth, Wisdom tooth, Anterior teeth

HOW TO CITE THIS ARTICLE: Ruba J Mohammad,The Relationship of Mandibular Wisdom Tooth Within the Crowding of Lower Anterior Teeth–A Literature Review, J Res Med Dent Sci, 2021, 9(9): 160-165

Corresponding author: Ruba J Mohammad
e-mail ✉ : rubajassim@uomosul.edu.iq
Received: 27/08/2021
Accepted: 13/09/2021

INTRODUCTION

The third molars represent a higher rate of impaction than any other teeth in modern populations [1]. In orthodontics, a great controversy about the role of the mandibular third molars in developing the lower anterior crowding or post-operative relapse [2]. Lower anterior crowding has been a subject of discussion and presented in the orthodontic literature concerning its etiology and development. Several orthodontists still believe that the eruption of the lower third molars occasionally produce an anterior force that causes crowding of the mandibular incisors [3,4]. A study reported that about 65% of American orthodontists and oral surgeons recommended the removal of unerupted or impacted third molars in patients during or after orthodontic treatment [5].

There is no sign to support or reject the prophylactic removal of asymptomatic impacted third molars. Therefore, most developed countries considered the prophylactic removal of impacted or fully erupted mandibular third molar as an appropriate method [3]. Niedzielska et al. suggested that the third molar erupts in a normal position and does not cause late lower incisor crowding if there is sufficient space for eruption [6]. Several studies did not confirm these conclusions about the correlation between lower third molars and the lower incisor crowding. However, there is no evidence to support or reject the relationship of lower third molar impaction to be the primary etiological factor in the post-treatment incisor crowding [2,7,8]. Thus, this subject becoming one of the most controversial in the orthodontic literature. The review aimed to identify literature related to the effect of the mandibular third molars on the lower anterior crowding.

LITERATURE REVIEW

Lower anterior crowding over the years has been a subject of continuous discussion and the subject of attention of authors concerning its etiology and development [9].

Contributing factors of mandibular incisors crowding

Dental crowding is defined as the disharmony between the size of teeth and the available space for their correct functional and aesthetic position, which increases the susceptibility of oral health to dental caries, and periodontal disease, and it affects dental and facial aesthetics [10]. Mandibular incisors crowding is observed in both patients who either received orthodontic treatment or not. Patients who had previous orthodontic treatment notice that their aligned teeth become crowded. A study suggests that approximately 2/3 of adolescents with good alignment and normal occlusions will develop incisor irregularity by early adulthood without orthodontic treatment [11].

Dental crowding is classified according to the time at which it appeared in the dentition to the primary, secondary, and tertiary crowding. Tertiary crowding or late dental crowding is developed between 15 to 20 years of age; thus it occurs in the mandibular incisors during the adolescence period and after [12]. The etiology of the late incisor crowding is multifactorial in nature. The lower

third molars eruption is considered the main etiologic factor followed by other factors such as teeth size, mandibular arch length, and width, ratio between jaw and size, dental arch shape, mandibular growth pattern, retroclination of the lower incisors, mesial movement of the posterior teeth, forces from the periodontal fibres, skeletal and soft tissue growth changes, gender, and the natural aging process [3,10,12-15].

There is a correlation between the dimensions of teeth and dental crowding; the larger the teeth size resulted in the more severe the malocclusion, whereas the smaller the teeth size resulted in additional spacing between the teeth. The mesiodistal size of teeth influences the development of this malocclusion [16]. González et al. found a relationship between the excess in teeth size and late mandibular crowding; the larger the mesiodistal dimension of the lower teeth leads to greater anterior teeth crowding [10]. The reduction of the mandibular base size without a decrease in the teeth size makes it necessary to perform extraction or interproximal reduction treatments [13].

The poor mandible growth with reduced mandibular body length leads to more incisor retroclination and verticalization, which aggravates the lower anterior crowding [10]. Janson, et al. demonstrated the relationship between mandibular length and dental crowding and concluded that the decrease in the mandibular length is an important factor associated with dental crowding [17]. The growth of the mandible is higher in comparison with the maxilla, and the basal bone grows more than the alveolar bone in the mandible, resulting in the limitation of the forward movement of the incisor teeth because of the restrictive effect of the upper dental arch. Thus, the lower anterior teeth will become retroclined and crowded [18]. Greater vertical growth of the mandibular is associated with more incisor teeth eruption to compensate for the increased vertical dental space and maintain the occlusion between the teeth, which increases the risk of anterior dental crowding [10].

The upward and forward mandible rotation leads to the mesial displacement of the erupted teeth and the lips exert greater pressure than the tongue creating a lingually directed force, resulting in the crowding of the lower anterior segment. In addition to that, the increased size of the mandible makes the lips exert more lingual pressure higher than the tongue pressure and resulted in incisor crowding [18]. The subjects with complete CL-II malocclusion and moderate to severe dental crowding having smaller maxillary and mandibular effective lengths when compared with those subjects without dental crowding [17,19]. Opposite to that, Al-Jwary et al. found no significant relationship between dental crowding and skeletal parameters in subjects with complete Class II malocclusion [20]. A study by Singh and Shivaprakash did not show any relationship between the direction of growth mandible and the degree of mandibular anterior crowding in the subjects with Class II malocclusion [21].

According to the relationship between gender and the mesiodistal teeth size, males have a significantly larger teeth size as compared to females [16]. Generally, dental crowding is more common in females because males had significantly longer and wider dental arch dimensions than females [22]. Regarding the effect of age on the anterior dental crowding, the literature stated that the tooth size to arch length discrepancy increases with age [22]. Antanas et al. found a reduction in average dental arch length between the subjects aged 12 to 25 years in both genders, where the discrepancy in the ratio between the teeth size and arch length increased with age [18]. Regalakshmi et al. conclude that the cause of the lower anterior crowding in the 18-21 years age patients is the impacted third molars [23].

Normally, there is a slight imbalance in the pressure on the teeth between the tongue on one side and the lips and cheeks on the other side. And the teeth are stabilized against this imbalance by the effect of forces produced in the periodontal membrane. The destructive changes in the periodontium may produce some pressure on the lower incisors lead to incisor crowding [6,24]. The hormonal changes during the adolescence stage or period of pregnancy might increase bone loss, and plasticity due to aging or periodontal disease may allow teeth to move under pressure. Therefore, it is more likely to develops dental crowding in later life than the teenage years [5]. From the biomechanical point of view, the dental arch horizontally represents a linked chain of dental contact classified as joints in which two convex articular surfaces are in contact. The convex-convex surfaces between the joints are mechanically unstable positions under compression by the dentogingival and dentoalveolar fibrous tissue [25]. Improper tooth-to-tooth relation can produce periodontal breakdown, orthodontic relapse [26]. The upper incisor teeth received a separating impulse with every knock of mastication, whereas the lower incisors tend to come into closer contact. Consequently, this compression might cause the teeth to slip past each other, especially in the incisal region [27]. Southard et al. concluded that periodontal forces could participate in the development of late lower arch crowding. They found significant correlations between interproximal force and mandibular anterior crowding, where the presence of a continuous force in the mandibular dentition compressed the proximal contacts, and this force was increased at the occlusal loading [28].

The eruption of the mandibular third molar is still to be the most common cause of anterior teeth crowding. Several studies stated that lower third molars can produce mesial force and cause crowding in the lower incisors.

Role of mandibular third molar in anterior teeth crowding

Various studies have been suggested that the mandibular third molars may cause an anterior crowding, according to the idea that its eruption leads to transmits a force anteriorly down the arch and concentrating on the lower

anterior region leading to malocclusion and rotation of the lower anterior teeth [12.29,30]. Niedzielska et al. concluded that the insufficient retromolar space aggravating dental crowding and malocclusion of lower anterior teeth which is caused by the eruption of the third molar that indicates the importance of the removal of the third molar [6].

Cheng and co-workers found that the erupted third molars may produce more anterior force and cause crowding of the mandibular incisors. They suggest the removal of the mandibular third molar to improve or prevent long-term incisor irregularity [4]. Also, Gopalasamy et al. and Regalakshmi et al. concluded that third molars strongly contributed to the crowding in the lower anterior teeth as a direct association between the source and cause [9,23]. Another study demonstrated that an increase in the total interproximal force due to the eruption of the third molar may indicate relapse in the lower anterior crowding and concluded that the orthodontists should give special attention to the possibility of relapse in the lower anterior teeth at 6 or more months after beginning the retention phase in cases with severe anterior crowding before treatment [31]. Al-Balkhi et al. suggested that the erupted third molars did not cause crowding of the mandibular anterior teeth when the tight interproximal contacts were removed because the mesial force of the erupting molars cannot be transmitted through the dental arch thus, it is preventing anterior tooth crowding [32]. Whereas, Southard, et al. conclude that removal of unerupted mandibular third molars does not significantly relieve proximal contact tightness therefore, extracting these teeth for the purpose of relieving interdental pressure to preventing mandibular incisor crowding appears to be unwarranted [28].

Lindauer et al. concluded that the American orthodontists and oral and maxillofacial surgeons are expected that the mandibular molars as a cause of dental crowding, and they were recommending their removal [33]. Gholinia et al. found that 21.2% of Iranian orthodontists believed that the third molar can cause late crowding but only 3.8% of them referred their patients for prophylactic removal to prevent future treatment relapse, most dentists who had studied in Iran, agreed with the removal of asymptomatic pathologic-free third molar due to lack of space [34]. Vergara et al. demonstrated by their cross-sectional study which was performed on the cast models and panoramic radiographs of orthodontically treated patients, that the mesioangular and horizontally positioned lower third molars eruption is one of the etiological factors that might aggravate lower anterior crowding and accordingly consider the third molar extraction as a precautionary measure to avoid crowding [35].

Several studies concluded that the idea belief that erupting third molars can cause crowding of the lower incisors after orthodontic alignment, must be questioned. The majority of orthodontists and oral surgeons believe that prophylactic extraction of the third is not beneficial in the lower arch to prevent incisor crowding [36]. Also, Azeem et al. in their cross-sectional study find those most of the Pakistani orthodontists support the opinion that there is no role of mandibular third molars to cause the mandibular anterior crowding [37]. Sood et al. concluded that no strong relationship exists between the eruption level, eruption space, and angulation of the third molar, and the level of mandibular anterior crowding in the Indian population [38]. Gökçe et al. concluded there is no correlation between the impacted third molar and the anterior crowding. Therefore, the extraction of the third molar is not crucial to avoid anterior tooth crowding or post-orthodontic relapse [39].

A study by Hamad, on the Iraqi population, demonstrates that there is little effect of proximal contact frictional strength generated from the unerupted third molar, and the forces detected at the proximal contact regions between posterior teeth may be attributed to the anterior component of occlusal forces. Thus, the impacted lower third molar does not exert any significant force on the teeth and does not cause lower incisor crowding. Therefore, removal of impacted lower third molars for preventing or relieving lower incisor crowding may be unjustified [40]. Also, Al-Hussainy et al. revealed that the high bone density at the lower canine region prevents the transmission of the force from angled third molars to affect the anterior teeth alignment [41]. Whereas other studies conducted on the Iraqi population concluded that the lower third molar may play a role in the development of anterior teeth crowding [42] and the orthodontic reason is the most common reason for lower third molar extraction [43]. If the prophylactic extraction of unaffected third molars is confirmed, it is ideally removed before adulthood to reduce the chance of incisor crowding [44].

Effect of permanent teeth extractions on mandibular third molars eruption

The presence, position, and angulation of mandibular third molars remain crucial clinical findings to orthodontists during the setup of the treatment plan. This is due to its influence on orthodontic treatment and the subsequent stability of treatment results [45]. The mandibular third molars show a higher rate of impaction than any other teeth in modern populations. This could be related to that the retromolar space frequently is inadequate [46]. The eruption of the mandibular third molars might be blocked in case of limited remodelling resorption at the anterior aspect of the mandibular ramus, in addition to that the eruption space for the mandibular third molars is affected by the direction of the teeth eruption. Therefore, retromolar space will be increased if the posterior teeth erupt more anteriorly [1]. Hence, the mesial movement of the molars during the closure of the extraction site could have a large effect on the mandibular third molar eruption.

Many studies suggested that the orthodontic treatment with extraction of the first premolars in the lower dental arch increases the chance of eruption of the lower third molar and decreases the risk of complications related to third molar impaction [1,30,47]. The mechanism might

be that premolar extraction therapy is increased the amount of mesial movement of the mandibular molar and increases the eruption space for the third molars [1].

Türköz et al. revealed that orthodontic treatment with premolar extraction aid in the mandibular third molar eruption. Through orthodontic treatment of two groups; one group with first premolar extractions and the other without extractions. They found a statistically significant increase in the ratio of the eruption of the third molars in the extraction group (36.4%) but, this ratio was (18.2%) in the non-extraction group, in addition, that the retromolar space was significantly higher in the group with extracted premolar [48]. The same findings were suggested by Al-Kuwari et al. in their study on the Saudi population [49]. Whereas the study on the Iraqi population concluded that the extraction of first premolars during orthodontic treatment significantly improved the uprighting of third molars, but not be guaranteed the perfect eruption of their third molars [50]. Sheikhzadeh et al. concluded that the extraction of first premolars did not have any significant positive effect on mandibular third molar angulation, but it could increase the posterior space for the eruption of wisdom teeth [51].

Clinically, not only premolar extraction but also first and second molar extraction can be performed to gain arch space. The significant increase of retromolar space gained by permanent tooth extractions, natural teeth spacing, or orthodontic mesial movement of the first and second permanent molar teeth enhances the probability of eruption of third molars [45]. The eruption pattern of an impacted lower third molar could be improved by the lower first permanent molar loss [52]. A study accomplished by Tarazona et al. concluded that the mandibular third molar angulation is improved over time, whether with or without extractions in orthodontic treatment [53]. The best time for the first permanent molar extraction is at the early development stage and when the second permanent molar is to achieve complete closure of the extraction space by the second permanent molar [54,55].

CONCLUSION

This review systematically analysed the available literature and assessed the role of the mandibular third molar in the aggravation of the lower incisors crowding or relapse of orthodontic treatment. Some authors support the idea about the relationship of the mandibular third molar with the late incisors crowding and suggesting the prophylactic removal, while the others do not support that.

From the review of the literature, I can suggest that more awareness needs to be created among the dentists, and a case-by-case management protocol is needed to make the right decision on choosing to extract or not extract the third molars which are based on the available scientific evidence combined with the professional's clinical experience.

REFERENCES

1. Kim T, Årtun J, Behbehani F, et al. Prevalence of third molar impaction in orthodontic patients treated nonextraction and with extraction of 4 premolars. Am J Orthod Dentofacial Orthop 2003; 123:138-45.
2. Zawawi KH, Melis M. The role of mandibular third molars on lower anterior teeth crowding and relapse after orthodontic treatment: A systematic review. Sci World J 2014.
3. Karasawa LH, Rossi AC, Groppo FC, et al. Cross-sectional study of correlation between mandibular incisor crowding and third molars in young Brazilians. Med Oral Patol Oral Cir Bucal 2013; 18:e505-9.
4. Cheng H, Peng B, Hsieh H, et al. Impact of third molars on mandibular relapse in post-orthodontic patients: A meta-analysis. J Dent Sci 2018; 13: 1-7.
5. Laskin DM. Evaluation of the third molar problem. J Am Dent Assoc 1971; 82:824e8.
6. Niedzielska I. Third molar influence on dental arch crowding. Europ J Orthod 2005; 27:518–523.
7. Al-Gunaid TH, Bukhari AK, El Khateeb SM, et al. Relationship of mandibular ramus dimensions to lower third molar impaction. Eur J Dent 2019; 13:213–221.
8. Al-Gunaid TH. Sex-related variation in the dimensions of the mandibular ramus and its relationship with lower third molar impaction. J Taibah Univ Med Sci 2020; 15:298-304.
9. Gopalasamy K, Rengalakshmi S, Pradeep D. Presence of mandibular third molars as a risk factor for lower anterior crowding- A retrospective study. Ann Trop Med Public Health 2020; 23:SP232305.
10. González MGA, Rodríguez LVL. Prevalence, types and etiologic factors of mandibular crowding in orthodontic patients in Tabasco, Mexico, 2015-2016. Revista Mexicana Ortodoncia 2018; 6:20-25.
11. Cetnar C. Observing anterior crowding in a population living a century ago. Dent 2016; 4.
12. Harradine NW, Pearson MH, et al. The effect of extraction of third molars on late lower incisor crowding: A randomized controlled trial. Brit J Orthod 1998; 25:117–22.
13. Hussain SS, Ashraf B, Khan SQ. Relationship of dental crowding to tooth size and arch dimensions in class i normal & class i malocclusion sample. Pakistan Oral Dent J 2014; 34:660-664.
14. Shah RB, Kanzariya N, Goje SK, et al. Assessment of role of mandibular third molar position in lower anterior crowding-A cross sectional study. J Integr Health Sci 2018; 6:69-73.
15. Schüutz-Fransson U, Lindsten R, Bjerklin K, et al. Mandibular incisor alignment in untreated subjects compared with long-term changes after orthodontic treatment with or without retainers. Am J Orthod Dentofacial Orthop 2019; 155:234-42.
16. Bansal V, Bansal PV, Aggarwal S, et al. Tooth size in crowded and spaced dentition among western uttar

pradesh population: A biometric study. Inter J Sci Study 2013; 1:82-88.

17. Janson G, Murillo Goizueta OE, Garib DG, et al. Relationship between maxillary and mandibular base lengths and dental crowding in patients with complete Class II malocclusions. Angle Orthod 2011; 81:217–221.
18. Antanas Š, Giedrė T. Effect of the lower third molars on the lower dental arch crowding. Stomatol Balt Dent Maxillofac J 2006; 8:80-84.
19. Singh R, Verma P, Pradhan D, et al. Association between maxillary and mandibular apical base lengths and severity of dental crowding or spacing in Class II malocclusion subjects: An in-vitro study. J Clin Exp Dent 2019; 11:e49-54.
20. Al-Jwary ET, Jarjees HT, Alluazy OH. Relationship of lateral dentoskeletal morphology to dental crowding in patients with class II malocclusions. Al–Rafidain Dent J 2017; 12-22.
21. Singh S, Shivaprakash G. To evaluate the correlation between skeletal and dental parameters to the amount of crowding in class II Div. 1 malocclusions. J Clinic and Diag Res 2017; 11:ZC22-ZC27.
22. Stanaitytė R, Gervickas GT. Do wisdom teeth induce lower anterior teeth crowding? A systematic literature review. Stomatol Balt Dent Maxillofac J 2014; 16:15-18.
23. Gopalasamy K, Rengalakshmi S, Pradeep D. Presence of mandibular third molars as a risk factor for lower anterior crowding-A retrospective study. Ann Trop Med Public Health 2020; 23:SP232305.
24. Indriyanti R, Efendi SH, Maskoen AM, et al. Predisposing factors analysis of mandibular anterior tooth crowding in the mixed dentition period by the tooth size and dental arch width. Padjadjaran J Dent 2018; 30:207-213.
25. Ihlow D, Kubein-Meesenburg D, Fanghänel J, et al. Biomechanics of the dental arch and incisal crowding. J Orofac Orthop 2004; 65:5-12.
26. Sarig R, Lianopoulos NV, Hershkovitz I, et al. The arrangement of the interproximal interfaces in the human permanent dentition. Clin Oral Invest 2013; 17:731–738.
27. Brodie AG. Retention. Angle Orthod 1939; 9:3-17.
28. Southard TE, Southard KA, Weeda LW. Mesial force from unerupted third molars. Am J Orthod Dentofac Orthop 1991; 99:220-225.
29. Tüfekçi E, Svensk D, Kallunki J, et al. Opinions of American and Swedish orthodontists about the role of erupting third molars as a cause of dental crowding. Angle Orthod 2009; 79:1139–1142.
30. Al-kharji AI, Alanazi AK, Alharbi MA, et al. The effect of third molar on orthodontic treatment: A systematic review. Saudi J Oral Dent Res 2020; 5:546-551.
31. Okazaki K. Relationship between initial crowding and interproximal force during retention phase. J Oral Sci 2010; 52:197-201.
32. Al-Balkhi KM. The effect of different lower third molar conditions on the re-crowding of lower anterior teeth in the absence of tight interproximal contacts one-year post orthodontic treatment: A pilot study. J Contemp Dent Pract 2004; 3:066-073.
33. Lindauer SJ, Laskin DM, Tüfekçi E, et al. Orthodontists' and surgeons' opinions on the role of third molars as a cause of dental crowding. Am J Orthod Dentofacial Orthop 2007; 132:43-48.
34. Gholinia F, Khalighi Sigarudi A, Ghavami Lahij Y. Indications for prophylactic removal of unerupted asymptomatic pathology-free third molars referred by iranian orthodontists. J Dentomaxillofaci Radiol Path Surg 2017; 6:43-48.
35. Vergara AD, Llinäs HJ, Bustillo JM. Incidence of lower anterior third molars on dental crowding. A New Approach. Int J Odontostomat 2017; 11:327-332.
36. Gavazzi M, De Angelis D, Blasi S, et al. Third molars and dental crowding: different opinions of orthodontists and oral surgeons among Italian practitioners. Prog in Orthod 2014; 15:60.
37. Azeem M, Hussain S, Tarique N, et al. The role of lower wisdom molars in orthodontic relapse of lower incisal crowding: results of a cross-sectional study. J Khyber Coll Dent 2018; 8:41-44.
38. Sood A, Bhullar M, Mittal S, et al. Relationship of mandibular third molar to mandibular anterior crowding. Dent J Adv Stud 2018; 6:89–96.
39. Gökçe G, Akan B, Veli I. The role of impacted third molar angulation on the anterior crowding. APOS Trends Orthod 2021; 11:56-61.
40. Hamad SA. Does impacted lower third molar exert a forwardly directed pressure? Zanco J Med Sci 2012; 16:139-144.
41. Al-Hussainy RH, Al-Jaanabi SZ, Al-Rawi BAO. Radiographical estimation of the impacted third molar in relation to the crowding in the lower arch. Ann Trop Med Public Health 2021; 24:SP24248.
42. Al-Sayagh NM, Mohammad AA, Ismail LM. The relationship of the third molar to the anterior dental crowding. Al–Rafidain Dent J 2004; 4:1-9.
43. Hasan LS, Ahmad FT, Abdullah EH. Impacted wisdom teeth, prevalence, pattern of impaction, complications and indication for extraction: A pilot clinic study in Iraqi population. Tikrit J Dent Sci 2016; 4:50-62.
44. Subhiksha KC, Thailavathy, Sabapathy K. Third molars in orthodontics. Europ J Mol Clin Med 2020; 7:1742-1748.
45. Miclotte A, Grommen B, de Llano C, et al, The effect of first and second premolar extractions on third molars: A retrospective longitudinal study. J Dent 2017; 61:55-66.
46. Santosh P. Impacted mandibular third molars: Review of literature and a proposal of a combined clinical and radiological classification. Ann Med Health Sci Res 2015; 5:229–234.

47. Salehi P. and Danaie SM. Lower third molar eruption following orthodontic treatment. East Medit Health J 2008; 14:1452-1458.
48. Türköz Ç, Ulusoy Ç. Effect of premolar extraction on mandibular third molar impaction in young adults. Angle Orthod 2013; 83:572–577.
49. Al-Kuwari HM, Talakey AA, Al-Sahli RM, et al. Influence of orthodontic treatment with first premolar extraction on the angulation of the mandibular third molar. Saudi Med J 2013; 34:639-643.
50. Mahmood AD. Changes in third molar angulations after first premolar extractions during fixed orthodontic treatment. Must Dent J 2009; 6:356-360.
51. Sheikhzadeh S, Geramy A, Rahmati Kamel M, et al. The effect of fixed orthodontic treatment with first premolar extraction on mandibular third molars angulation and retromolar space. Caspian J Dent Res 2018; 7:43-8.
52. Sousa AS, Araújo FRL, Villela GSC, et al. Impact of early loss of lower first permanent molars on third molar development and position. Pesqui Bras Odontop Clín Integr 2021; 21:e0072.
53. Tarazona B, Paredes V, Llamas JM, et al. Influence of first and second premolar extraction or non-extraction treatments on mandibular third molar angulation and position. A comparative study. Med Oral Patol Oral Cir Bucal 2010; 15:e760-766.
54. Saber AM, Altoukhi DH, Horaib MF, et al. Consequences of early extraction of compromised first permanent molar: A systematic review. BMC Oral Health 2018; 18:59.
55. Serindere G, Bolgul B, Parlar T, et al. Effects of first permanent molar extractıon on space changes observed in the dental arch using data mining method. Niger J Clin Pract 2019; 22:936-942.