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Professional paper

EFFECT OF MANDIBULAR THIRD MOLARS ON INCISAL MANDIBULAR CROWDING IN PATIENTS WITHOUT PREVIOUS ORTHODONTIC TREATMENT

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Abstract

Third molars are characterized by variability in the presence or absence in the oral cavity, time of their formation and calcification. Mandibular incisal crowding is described as the discrepancy between the mesiodistal widths of the four permanent incisors and the available space in the alveolar process. The aim of this research is to assess the potential influence of mandibular third molars on the development of lower incisor crowding through determination of retromolar eruption space and eruption level of third molars. Examinations are performed on mandibular study plaster orthodontic models and orthopantomographic images of patients, aged between 12 and 22 years. Based on the Little's index of irregularity: the sample is divided in two groups. Retromolar eruption space was determined by: determination of the Ganss Ratio. Evaluation of the eruption level of the mandibular third molars is determined according to Pell and Gregory. There was no significant difference between patients from the study and control groups in terms of Ganss ratio value(t-test (11)=-0.261 p=0.7989). A significant difference was determined between patients from the study and control groups in terms of dental crowding (t-test (11)=-4.679 p=0.0007). In patients with the index of irregularity > 3mm Level B eruption of mandibular third molars was present with higher frequency (75%) in the examination group and (40%) in the control group. There is no great correlation between the retromolar eruption space for the third molars, the level of eruption and the mandibular incisal crowding.

Keywords: third molars, incisal mandibular crowding, Ganss Ratio, Pell and Gregory, orthodontic models, orthopantomographic images.

1. Introduction

Third molars are characterized by variability in their presence or absence in the oral cavity, their eruption course and final position and their crown and root morphology (Zigante, M et al 2018) The radiographic appearance of third molars begins at the age of 5 years, they usually erupt between 16 and 24 years, and their position and angulation change by time of the eruption and the development period, showing important pre-eruptive rotational movements. (Ambika Sood et al 2018); (Mazzilli, L.E.N 2018) Since incisal mandibular crowding coincides with the chronological time of eruption of third molars and appears to be a cause-and-effect relationship, prophylactic extraction of mandibular third molars seems a logical preventive measure for tertiary mandibular crowding (Kindler, S et al 2019) (Cheng, H.C 2018) (Consolaro A et al 2018). Mandibular incisal crowding is described as the discrepancy between the mesiodistal widths of the four permanent incisors and the available space in the alveolar process (Sasso, A et al 2015) (Husain S et al 2021). The crowding of the incisors is not only a discrepancy between the size of the teeth and the arch, but it is also a discrepancy between several variables (Genest-Beucher, S et al 2018) (Cotrin, P et al 2020) such as: the anterior component of the occlusion force, the physiological mesial drift of the teeth, occlusal changes, the mesial vectors of the muscle contraction, development of third molars, amount and direction of late mandibular growth, skeletal morphology and complex growth patterns. The aim of this study is to assess the potential impact of mandibular third molars on the

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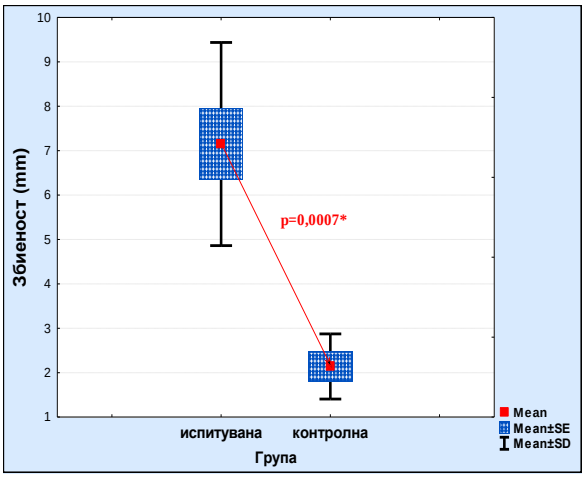
development of lower incisor crowding, by analyzing and assessing the retromolar third molar eruption space and the level of third molar eruption.

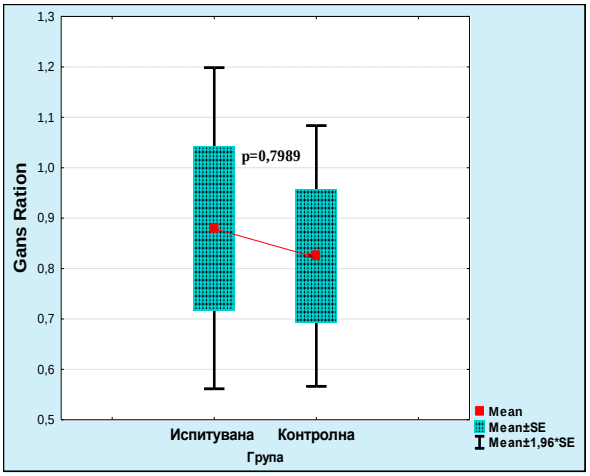
2. Material and method

The clinical research is carried out in the specialised polyclinic for oral surgery and orthodontics Alba Ortodent, Tetovo and supervision by the Department of Orthodontics at the Faculty of Dentistry at UKIM in Skopje. The material consists of orthodontic plaster studio models and orthopantomogram images of 13 male and female subjects aged 12 to 22 years with crowding of mandibular incisors. The selection of patients in the research sample is limited by certain criteria for patient selection. The respondents are divided into two groups depending on the irregularity index according to Little. The first group is the control group consisting of subjects with an irregularity index of 0 to 3 mm, and the second group is the study group consisting of subjects with an irregularity index greater than 3 mm. The orthopantomogram images were taken at the same time as the study models. Radiographs are performed with an orthopantomogram (OPG) device, Carestream CS 8100 2D. 1. Assessment of the incisal mandibular density of mandibular studio models is performed based on the irregular index according to Little. Little's Irregular Index is a quantitative method for assessing mandibular incisal crowding, where the linear horizontal displacement of the anatomical contact points of each mandibular incisor with the adjacent teeth, between the lower canines, is measured. Each of the five measurements represents the horizontal linear distance between the vertical projection of the anatomical contact points of adjacent teeth. The sum of those 5 linear distances is the degree of incisal irregularity. Each of the subjects is subjectively ranked on a scale of 0-10 mm, using the following criteria 0 - ideally aligned mandibular incisors, 1,2,3 - minimal irregularity, 4,5,6 - moderate irregularity, 7,8,9 - severe irregularity, 10-20 – very severe irregularity. Based on the obtained values, the research sample was divided into two groups. First group - control group with minimum incisal mandibular density, in which the irregular index according to Little is from 0 to 3 mm. Second group - studied group with pronounced incisal mandibular crowding, in which the irregular index according to Little is greater than 3mm. 2. Linear and angular measurements are performed on orthopantomogram images of each subject, which relate to the assessment of: the space for the eruption of the third mandibular molars, the level of eruption (depth of eruption) of the third mandibular molars. Assessment of the eruption space of the third mandibular molars is determined by: measurement of the available space for the eruption of the third molars (retromolar space) as a linear distance between the intersection of the occlusal plane with the anterior border of the ramus of the mandible and the intersection of the line perpendicular to the occlusal plane from the most distal point of the second permanent lower molar. Measurement of the mesiodistal width of the third molars as a linear measurement of the length of the line joining the most mesial and most distal border of the crown of the lower third molar. Determination of the Ganss ratio - as a ratio between the available space and the mesiodistal width of the third molars. Ganss ratio = A/B where : A is the distance between the distal border of the crown of the second permanent lower molar and the anterior border of the ramus measured on the occlusal plane B is the width of the crown of the lower third molar. Assessment of the eruption level (eruption depth) of the third mandibular molars is determined as the depth of the third molars in relation to the adjacent second molars, according to Pell and Gregory, and is determined in three levels: level A (fully erupted) – the third molar (M3) is at the same level or above the occlusal plane of the adjacent second molar. (M2). Level B (partially erupted) - the third molar (M3) is below the occlusal plane, but above the cemento-enamel junction of the second molar. (M2) Level C (unerupted) - the third molar (M3) is below the cemento-enamel junction of the second molar (M2).

3. Results

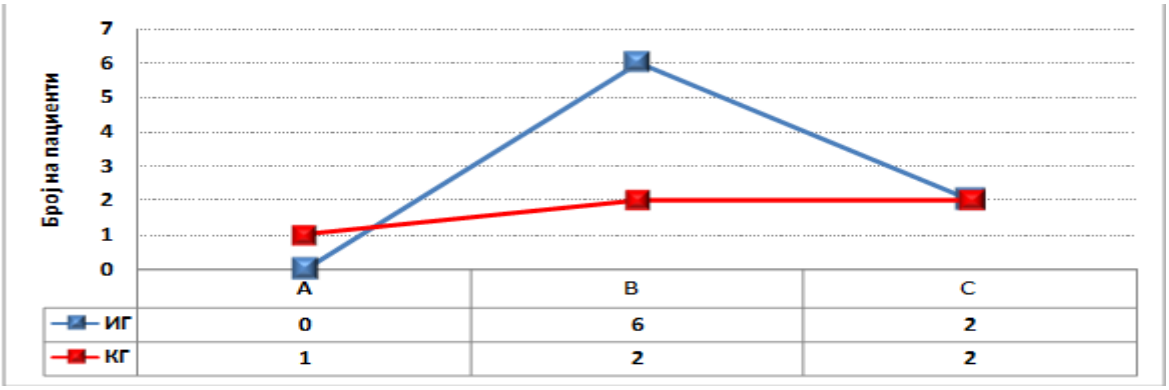
The data obtained during the research were statistically processed using the SPSS software package, version 22.0 for Windows (SPSS, Chicago, IL, USA). The research included two groups of respondents aged 12-22. Depending on the irregularity index according to Little, the subjects were divided into an experimental and a control group. The test group consisted of subjects with an irregularity index greater than 3 mm, and the control group was subjects with an irregularity index of 0 to 3 mm.
A significant difference was determined between the patients from the study group and the control group regarding the density of the teeth (t-test (11)=-4.679 p=0.0007), in addition to a significantly higher density in the patients from the study group (Graph 1).





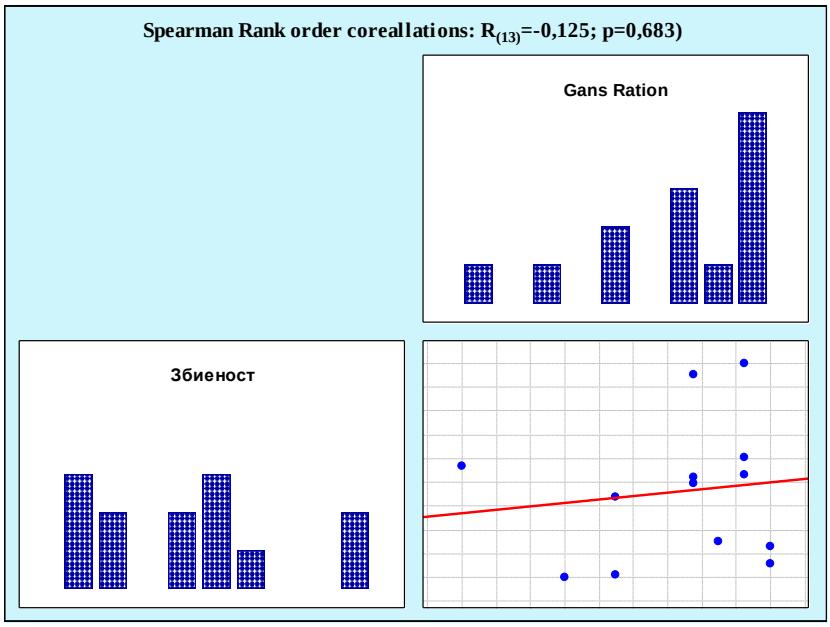
Graph 1. Intergroup comparison according to tooth crowding Graph 2. Intergroup comparison according to Ganss Ratio

The average value of the Ganss ratio of the patients from the studied group with the irregularity index > 3mm was 0.82±0.37mm. There was no significant difference between patients from the study and control groups in terms of Ganss ratio value (t-test (11)=-0.261 p=0.7989) (Graph 2). The analysis indicated that in the examined group of patients with an index of irregularity > 3mm, none of the patients had eruption level A, and with eruption level B or C there were consistently 6 (75%) vs. 2 (25%) patients. In the control group, with an irregularity index of 0-3mm, there were 1 (20%) patients with eruption level A, and with eruption level B and C there was an equal proportion of patients, 2 (40%) each (Graph 2).
There was no significant association between the group to which the subjects belonged and the level of eruption B and C (p=0.4061) (Graph 2)



Graph 2. Distribution of the sample in the examined and control group according to the level of eruption

The additional analysis of the relationship between tooth density and Ganss ratio value indicated a non-significant linear positive correlation for Spearman Rank order correlations: R(13)=-0.125; p=0.683) - with the increase in tooth density, the value of Ganss ratio also increased insignificantly (Graph 3).



Graph 3. Non-parametric correlation of tooth density and Ganss ratio

4. Discussion

The development of the third molar space is influenced by various factors. Eruption of the third molar can be predicted at an early age during orthodontic treatment, and then later occurrences of severe impactions can be avoided. The research analyzed gnathometric orthodontic models from patients with crowding of the mandibular incisors aged 12 to 22 years. Depending on the irregularity index according to Little, the subjects were divided into an experimental and a control group. The test group consisted of subjects with an irregularity index greater than 3 mm, and the control group was subjects with an irregularity index of 0 to 3 mm. A significant difference was determined between the patients from the study group and the control group regarding the density of the teeth (t-test (11)=-4.679 p=0.0007), in addition to a significantly higher density in the patients from the study group. In order to assess whether the variations of lower third molars have an influence on the mandibular incisal crowding, orthopantomogram images of the patients were analyzed. Analyzes were made to

assess the space for the third molars and the level of eruption of the mandibular third molars. The assessment of the space for the eruption of the third mandibular molars was determined by the Ganss ratio, which is the ratio between the available space for the third molars and the mesiodistal width of the third molars. The average value of the Ganss ratio of the patients from the study group with the index of irregularity > 3mm was 0.82 ±0.37mm. There was no significant difference between the patients from the study group and the control group in terms of Ganss ratio value (t-test (11)=-0.261 p=0.7989). Evaluation of the eruption level (eruption depth) of the third mandibular molars is determined as the depth of the third molars in relation to the adjacent second molars, according to Pell and Gregory, and is determined in three levels: level A, level B, level C. The analysis indicated that in the examined group of patients with an index of irregularity > 3mm, none of the patients had eruption level A, and with eruption level B or C there were consistently 6 (75%) vs. 2 (25%) patients. In the control group, with an irregularity index of 0-3mm, there were 1 (20%) patients with eruption level A, and with eruption level B and C there was an equal proportion of patients, 2 each (40%). There was no significant association between the group to which the subjects belonged and the level of eruption B and C (p=0.4061). The additional analysis of the relationship between tooth density and Ganss ratio value indicated a non-significant linear positive correlation for Spearman Rank order correlations: R(13)=-0.125; p=0.683) - with the increase in tooth density, the Ganss ratio value also increased insignificantly. The results of this study showed no clinically significant correlation between the mandibular third molar and the crowding of the mandibular incisors. Our results confirm the results of the authors of previous studies, (Ambika Sood et al 2018); (Mazzilli, L.E.N 2018) which determined that third mandibular molars are not related to incisal mandibular crowding. The role of the third molar is still a debatable issue despite extensive attempts to evaluate its role in tertiary mandibular crowding. Further detailed studies are needed to evaluate the correlation between mandibular incisal crowding and third molar, eruption level, eruption space and angulation of mandibular third molars in different skeletal malocclusions and in different facial morphologies.

5. Conclusion

The results of our research showed that mandibular third molars have no influence on the occurrence of incisal mandibular crowding. We anticipate that the knowledge that will emerge from this research will provide correct guidelines and recommendations for justified extraction or monitoring of third molars in order to prevent tertiary mandibular crowding, as well as in the planning of retention procedures after the end of active orthodontic treatment, emphasizing stability of the results.

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