Relationship Between Skeletal and Dental Malocclusions in the Sagittal Direction in Turkish Orthodontic Patients: A Retrospective Study

Türk Ortodonti Hastalarında Sagital Yönde İskeletsel ve Dental Maloklüzyon-ların İlişkisi: Retrospektif Bir Çalışma

Saadet ÇINARSOY CİĞERİM [1]*, **Jamil BAYZED** [1], **Gönül DİNÇ** [2], **Fatih KAZANCI** [3], **Hüseyin Melik BÖYÜK** [1]*, **Helin DURSUN** [1]*,

[1] Department of Orthodontics, Faculty of Dentistry, Van Yuzuncu Yil University, Van, TURKEY.

[2] Special Orthodontist. Van, TURKEY.

[3] Special Orthodontist. Çorum, TURKEY.

* **Corresponding author:** Jamil BAYZED; E-mail: drjamilmaher@gmail.com

ÖZET

Amaç: Bu çalışma iskeletsel ve dental maloklüzyonların sagital yönde uyumunu değerlendirmeyi amaçla-maktadır.

Materyal ve Metot: Van Yüzüncü Yıl Üniversitesi Diş Hekimliği Fakültesi Ortodonti Kliniği'ne başvuran, kraniofasiyal anomalisi olmayan, daha önce ortodontik tedavi görmemiş ve travma öyküsü olmayan 11-18 yaş arası 230 hasta (erkek, kadın) çalışmaya dahil edildi. Bireyler ANB açılarına göre gruplara ayrıldı. Farklı sagital iskeletsel maloklüzyonlarda molar ilişkiler incelendi. Bilgileri değerlendirmek için tanımlayıcı analiz ve Pearson ki-kare testi kullanıldı. Elde edilen veriler istatistiksel olarak %5 anlamlılık düzeyinde analiz edilmiştir.

Bulgular: 12-30 yaş arası 230 kişi ANB açılarına göre gruplara ayrıldı. İskeletsel Sınıf 1 maloklüzyonlu birey-lerde molar ilişki en fazla Angle Class II olarak belirlenmiştir, Angle Class IV ise en az görülen ilişkidir. İskel-etsel Sınıf 2 maloklüzyonu olan bireylerde molar ilişki en fazla Angle Sınıf II olarak belirlenirken, Angle Sınıf III subdivizyon en az görülen ilişkidir. İskeletsel Sınıf 3 maloklüzyonlu bireylerde molar ilişki en fazla Angle Class III olarak belirlenirken, en az Angle Class IV olarak belirlenmiştir.

Sonuç: Bu çalışmada iskeletsel maloklüzyonlar ile molar ilişkiler arasında anlamlı bir ilişki olduğu gözlendi. Ancak molar ilişkinin iskeletsel maloklüzyon dışında farklı faktörlere bağlı olarak değişebileceği düşünülmektedir.

Anahtar Kelimeler: İskeletsel Maloklüzyonlar, Molar ilişki, Sagital Yön.

ABSTRACT

Objective: This study aims to evaluate the compatibility between skeletal and dental malocclusions in the sagittal direction.

Material and Method: 230 patients (male, female) aged 11-18 years, who applied to Van Yüzüncü Yıl Univer-sity Faculty of Dentistry Orthodontic Clinic, had nocraniofacial anomaly, had not received orthodontic treat-ment and had no history of trauma, were included in the study. Individuals were divided into groups ac-cording to their ANB angles. The molar relationships in different sagittal skeletal malocclusions were exam-ined. Descriptive analysis and the Pearson chi-square test were used to evaluate the information. The obtained data were statistically analyzed at the 5% significance level.

Results: 230 individuals between the ages of 12-30 were divided into groups according to their ANB angles. In individuals with skeletal Class 1 malocclusion, the molar relationship was Angle Class II at most and Angle Class IV at most negligible. In individuals with skeletal Class 2 malocclusion, the molar relationship was determined as Angle Class II at most, while Angle Class III subdivision and nomolar relationship were ob-served at least. In individuals with skeletal Class 3 malocclusion, the molar relation was Angle Class III at most, Angle Class IV at least, and nomolar relation.

Conclusion: In this study, it was observed that there was a significant relationship between skeletal malocclu-sions and molar relationships. However, it is thought that the molar relationship may vary due to different factors other than skeletal malocclusion.

Keywords: Molarrelation, Skeletal Malocclusions, Sagittal Direction.

INTRODUCTION

Orthodontics is a branch of science that deals with correcting dentofacial deformations and malocclu-sions to achieve optimum aesthetics and function. The aim of orthodontic treatment is not only to achieve functional occlusion. Increasingly, aesthet-

ic-oriented needs have led to a focus on profile aesthetics. Today, facial appearance is why most patients apply for orthodontic treatment (Gomez et al., 2017; Maetevorakul et al., 2016).

Malocclusion is non-normal relations between tooth groups, dental arches, lower jaw, and upper jaw teeth. Classification of occlusion is evaluated in separate dimensions in the spatial plane. The first classification made by Edward H. Angle was made according to the mesiodistal relationship of permanent molars.

In addition to this classification, malocclusion is evaluated sequentially according to whether the lower and upper jaws are relative to the cranial base of the skull in the sagittal direction. Malocclusions are classified as Class I, Class II, or Class III based on the maxillo-mandibular relationship in the sagittal order concerning the skull base (Kozanecka et al., 2016; Ülgen., 2015).

When the literature is examined, many studies examine the prevalence of malocclusion according to race such as Caucasian, Italian, Nigerian, and Black American (Kerosuo, 1990; Ciuffolo et al., 2005; Onyeaso et al., 2002; Garner et al., 1985). In studies conducted, malocclusion prevalences were found to vary between 11% and 93% (Vig and Fields, 2000; Gelgor et al., 2007).

While it is difficult to describe the disparities between the groups studied, it does lead us to believe that these discrepancies may arise as a result of variances in patient registration, ethnic structure, social environment and age groups (Thilander et al., 2001).

Furthermore, evaluating patient groups who are seeking orthodontic treatment is critical in terms of arranging clinical objectives based on the patient population. When looking through the literature, it is clear that there is research that looks at the compatibility and relationship between skeletal and dental malocclusion in the sagittal plane. It's crucial to look at the causes underlying this connection. In orthodontic diagnostic and treatment planning, it's

a popular topic whether the dental relationship in the sagittal plane is related to the skeletal relationship. In this context, the study's goal is to determine the sagittal relationship between skeletal and dental malocclusion.

Whether or not the dental relationship is related to the skeletal relationship in the sagittal plane, it is a focal point for orthodontic diagnosis and treatment. The study's goal is to see how skeletal and dental malocclusions interact in the sagittal plane.

MATERIALS and METHODS

In this retrospective study, individuals who applied to Van Yüzüncü Yıl University Faculty of Dentistry Orthodontic Clinic between 2014-2018 without craniofacial anomalies, who did not receive orthodontic treatment, who had no trauma history and no impacted teeth were included. Following the planning of the study, ethics committee approval was obtained from the Clinical Research Ethics Committee (Karar no:2021/02-32).   The research was conducted in accordance with the principles of the Declaration of Helsinki. A total of 230 patients, 147 girls, and 83 boys, aged 12-30 years, were randomly selected and included in the study. Intraoral photographs panoramic and cephalometric radiographs of the patients included in the study were examined, and care was taken to ensure that the patients were in the permanent dentition period and did not have congenitally missing or impacted teeth. ANB values of the patients were determined due to lateral cephalometric analysis. Individuals were divided into groups according to ANB angle as skeletal Class 1 (ANB 0°-4°), skeletal Class 2 (ANB>4°), and skeletal class 3 (ANB<0°). According to the Angle Classification, the molar relation values determined as a result of clinical examination and measurements of the patients have been recorded as Class I, Class II, Class III, Class IV, Class II subdivision and Class III subdivision according to the Angle classification(Figure 1). During the clinical examination, the molar relations of the patients were evaluated in centric occlusion and recorded. In

addition, the measurements of the patients were assessed with intraoral-extraoral photographs and dental models, and their molar relations were examined in detail.

Statistical Analysis

The obtained data were transferred to the computer environment, and statistical analysis was performed with the SPSS (Statistical Package for the Social Sciences) 21.0 version package program. Descriptive analyzes and the Pearson chi-square test were used to evaluate the information. The statistical significance level was determined as p=0.05. Ethics committee approval was received for this study from the Van Yüzüncü Yıl University Faculty of Medicine Ethics Committee (03/08/2021, Decision no: 03). The patients were informed in detail about the purpose and process of the study. Patients who voluntarily signed the "informed consent form" approved by the ethics committee were included in the study after obtaining the consent of their parents.

RESULTS

Of the 230 individuals aged 12-30 years included in the study, 147 were female, and 83 were male. When the age distribution and average age of the individuals participating in the study by gender are examined; While the mean age of female patients (n=147) was 15.7 years, the mean age of male patients (n=83) was 14.4. The mean age of all individuals participating in the study was found to be 15.2 years. Molar relationship in 2.6% (n=6) of a total of 230 individuals; While it cannot be detected due to the missing of at least one of the maxillary or mandibular first molars, 23.5% (n=54) Angle Class I, 42.6% (n=98) Angle Class II, 10.4%' (n=24) Angle Class III, 2.6% Angle Class IV, 11.3% (n=26) Angle Class II Subdivision, and 7% (n=16) Angle Class III Subdivision seen. The evaluation of the molar relationship status of the individuals accord-

ing to the ANB angle is shown in Table 1. Of the individuals, 46.5% (n=107) were skeletal Class I, 30% (n=69) skeletal Class II, and 23.5% (n=54) skeletal Class III. In the right-sided molar relationship evaluation, 30.9% of the patients were Angle Class I, 47.4% Angle Class II, 15.2% and Angle Class III, 6.5% were closing due to missing at least one of the molar teeth observed to be absent. Evaluating the left-sided molar relationship, 29.6% of the patients were Angle Class I, 49.1% Angle Class II, 14.8% Angle Class III, and 2.6% were missing at least one molar tooth, not any relationship. (Table 1)

Considering the distribution of molar relations by gender, 2.7% of female individuals were in the no molar relation group, 23.8% were Angle Class I, 44.9% Angle Class II, 7.5% Angle Class III, It was found that 1.4% was Angle Class IV, 12.2% was Angle Class II Subdivision and 7.5% was Angle Class III Subdivision. In males, 2.4% were in the no molar bite group, 22.9% Angle Class I, 38.6% Angle Class II, 15.7% Angle Class III, 4.8% Angle Class IV, 9.6% Angle Class II Subdivision, and 6.0% Angle Class III Subdivision. (Table 1). No statistically significant difference was found between gender and molar relationship (p>0.05).

When the relations between skeletal malocclusions and molar closure were evaluated, it was observed that the molar relation was the most Angle Class II and the minor Angle Class IV in individuals with skeletal Class 1 malocclusion. In individuals with skeletal Class 2 malocclusion, the molar relationship was determined as Angle Class II at most, while Angle Class III subdivision and no molar relationship were observed at least. In individuals with skeletal Class 3 malocclusion, the molar relationship was found to be Angle Class III at most, while Angle Class IV and molar relationship were found to be the least. The correlation between skeletal malocclusions and molar relationships was statistically significant (p<0.05).

Table 1. Skeletal malocclusion and molar relationship distribution.

		n	%
Gender	female	147	63,9%
	male	83	36,1%
Skeletal malocclusion	Class 1	107	46,5%
	Class 2	69	30,0%
	Class 3	54	23,5%
Right molar relationship	Class I	71	30,9%
	Class II	109	47,4%
	ClassIII	35	15,2%
	No molarrelationship	15	6,5%
Left molar relationship	Class I	68	29,6%
	Class II	113	49,1%
	Class III	34	14,8%
	No molarrelationship	15	6,5%
Molar relationship	No molarrelationship	6	2,6%
	Class I	54	23,5%
	Class II	98	42,6%
	Class III	24	10,4%
	Class IV	6	2,6%
	Class II Subdivision	26	11,3%
	Class III Subdivision	16	7,0%

Figure 1. Angle classification

DISCUSSION

The need for orthodontic treatment rapidly increases daily in many countries and reaches serious numbers (Thilander et al., 2001). In line with this increasing treatment need, many studies have been carried out to determine the prevalence of malocclusions in various societies (Kozanecka et al., 2016; Ülgen, 2015; Kerosuo,1990; Ciuffolo et al., 2005; Onyeaso et al., 2002). However, the fact that different results were obtained even in studies carried out on similar populations reveals how much malocclusions can differ between regions. Studies evaluate the prevalence of malocclusion according to many different ethnic groups in the literature (Kerosuo,1990; Ciuffolo et al., 2005; Onyeaso et al., 2002; Garner and Butt., 1985). The Prevalence of malocclusion varies between 11% and 93% in studies (Garner and Butt., 1985; Vig et al., 2000; Gelgor et al., 2007). Although it is difficult to explain these severe differences between the groups examined, this difference is due to the different patient groups recorded, ethnicity, social. It is thought that it may occur depending on the frame and age group (Thilander et al., 2001). However, the evaluation of patient groups applying for orthodontic treatment is essential in arranging clinical needs by considering the applicant patient population.

Many studies have investigated whether different skeletal malocclusions affect the soft tissue thickness of individuals, but gender differences were not evaluated in every study (Uysal et al., 2009; Kalha et al., 2008; Utsuno et al., 2010a; Utsuno et al., 2010b). Utsuno et al assessed the effect of skeletal malocclusions on soft tissue in women aged 6-16 and 17-33 years (Utsuno et al., 2010a; Utsuno et al., 2010b). This study found no statistically significant difference between gender and molar relationships. Other research explores the distribution of maxillary midline diastema and dental midline deviation in patients with varied skeletal malocclusions. Maxillary midline diastema and dental midline deviation were similar in various skeletal malocclusions (Çınarsoy Ciğerim et al., 2019). In this study, it was observed that there was a significant relationship between sagittal skeletal malocclusions and molar relations.

Zupancic et al., (2008) observed that overjet is a predictive factor of sagittal skeletal relationships in Class II division I anterior relation (Zupancic et al., 2008). In a study looking at the relationship between dental malocclusion and skeletal malocclusion in the sagittal plane in orthodontic patients, the incisal classification was found to be significantly related with WITS evaluation. In contrast, with ANB, the association was marginally significant (Al-Hamlan et al., 2015). In this study, it was observed that there was a substantial relationship between sagittal skeletal malocclusions and molar relations.

In a study examining molar and canine relationships, Class II half and full-step asymmetries were more prevalent than Class III asymmetries in the

molar and canine regions (Behbehani et al., 2012). In this study, in individuals with skeletal Class 1 malocclusion, the molar relationship was found to be Angle Class II at most and Angle Class IV at most negligible. In individuals with skeletal Class 2 malocclusion, the molar relationship was determined as Angle Class II at most, while Angle Class III subdivision and no molar relationship were observed at least. In individuals with skeletal Class 3 malocclusion, the molar relation was Angle Class III at most, Angle Class IV at least, and no molar relation. It has been found that there is a relationship between skeletal malocclusions and molar relationships.

Conclusion

This study is the first study to examine the concordance between sagittal skeletal malocclusions and molar relationships. In this study, it was observed that there was a significant relationship between sagittal skeletal malocclusions and molar relations. However, it is thought that the molar relationship may vary due to different factors other than skeletal malocclusion

Conflict of interest

The authors declare that there is no conflict of interest.

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