Original Article

CORRELATION BETWEEN OVERJET AND VERTICAL FACIAL PATTERN IN UNTREATED CLASS II DIVISION 1 ORTHODONTIC PATIENTS

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ABSTRACT

Introduction: *In orthodontics, proper assessment of vertical and sagittal relationship is important for an accurate diagnosis and treatment planning.Overjet is one of the parameters to evaluate the sagittal relationship and is considered a good predictor of sagittal relationship in class II division I patients.But there is conflictingevidence whether overjet can predict the vertical facial morphology in class II division I patients. The purpose of current study was to evaluate the correlation between vertical facial morphology and overjet value in untreated class II division I malocclusion.*

Materials and Methods: *A cross-sectional study was conducted at Khyber college of dentistry from the pretreatment orthodontic records of 100 patients who visited from June 2017 to December 2017 by using convenient sampling technique Overjet was measured on study cast was taken from each subject, with digital vernier caliper and vertical cephalometric parameters were taken from pretreatment orthodontic record fileof each patient. Pearson correlation analysis was used to correlate the overjet and vertical cephalometric parameters.*

Results: *The means of all vertical facial cephalometric parameters were in normal range representing an average facial pattern in patients with class II/I malocclusion.There was an insignifcant correlation between overjet and vertical facial parameters.*

Conclusions: *Overjet is not a predictor of vertical facial morphology in untreated class II division 1 patients.*

Keywords: *Overjet, vertical facial pattern, malocclusion, Orthodontics.*

INTRODUCTION

Class II malocclusions have been described as the most common treatment problem in practice and one of the difficult orthodontic problem to treat.[1] Based on angle's malocclusion classification ,class II malocclusion is defined as in which the mesiobuccal cusp of the upper first permanent molar occludes mesial to the mesiobuccal grove of lower first permanent molar and class II div 1 with maxillary incisor being protrusive resulting in increased overjet.[2] Erum G et al. 2008 , a local hospital based study conducted in Pakistan showed that 70.5% patients had angle's class II and among them 64.7% had classII/1, and 75% had increased overjet.[3] Overjet is the linear measurement (usually in mm) between the upper incisal edge and the labial surface of the lower incisor. The normal value is considered to be 2-3mm.[4] Overjet is used to assess the sagittal relationship of upper and lower arch.[5] Accordingly to the index of orthodontic treatment need, increased overjet of >6mm is considered as a severe problem needs orthodontic treatment.[6]

The relationship between a sagittal skeletal dimension and Craniofacial morphology of class II malocclusion has been studied in some cephalometric investigation 7-11, but few studies take overjet into the account. Accordingly, to zupanic[5] et al., 2008, overjet was found to be a highly significant predictor of sagittal relationship, but recent studies reported a positive association between increased overjet and tendency toward hyper divergent facial pattern.[1,12] Although a study conducted by Nita kumara[13] et al., 2015, showed that overjet value is not a predictor of the vertical facial morphology, patients with class II division 1 malocclusion had an average vertical growth pattern.

In orthodontics, appropriate diagnosis and treatment planning are the most important steps

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for achieving orthodontic treatment goals like facial esthetic, functional efficiency and stability of results obtained.[13] Hense detailed knowledge of relationship between dental and skeletal component that contribute to malocclusion is essential in treatment planning .[7]

Because of variations in results obtained from the studies in the past, more studies need to be conducted to establish the fact that whether there exists an association between increased overjet in angle class II division 1 malocclusion and vertical facial pattern. This study aimed to determine the relationship between increased overjet and vertical facial pattern in class II division 1 untreated patients in a sample of Pakistani population.

MATERIAL AND METHODS

A cross-sectional study was conducted after ethical approval obtained from hospital ethical committee of Khyber college of dentistry. The data was collected from the pretreatment orthodontic records of 100 patients who visited the orthodontic department of Khyber college of dentistry Peshawar Pakistan from June 2017 to December 2017. Sampling was done using convenient sampling technique.The inclusion criteria were subjects of Pakistani origin having class II division 1 malocclusion with overjet > 4mm and age range of 8 – 30 years with no history of previous orthodontic treatment were included in this study. Exclusion criteria were patients with craniofacial anomalies, and missing first permanent molar was excluded.

A data extraction form was used to obtain sociodemographic data and findings from pretreatment orthodontic record file. Data were collected from standard pretreatment lateral cephalograms at the Khyber college of dentistry. These lateral cephalograms were recorded with rigid fixation and 165 cm film – to tube distance using Cephalogram (Orthoralix 9200, UK). The head was fixed in a way that the sagittal plane was at right angle to the path of x-rays and the Frankfort horizontal plane was parallel to the horizontal plane; teeth were occluded in the centric occlusion and lips were maintained in a relaxed position.

Cephalograms were traced manually by the principal investigator on acetate paper in a dark room. Cephalometric landmarks were marked (Fig 1), and cephalometric parameters were measured (Fig 1-3). Overjet was measured on study cast was taken from each subject, with a digital vernier caliper.

Data analysis was performed using the SPSS for Windows (version 20.0, SPSS Inc ., Chicago, IL, USA). Descriptive statistic was calculated for age and different vertical facial cephalometric angle of class II/1 patients. Pearson's correlation was used to correlate various parameters, and a P value less than 0.05 was considered significant.

RESULTS

A total of 100 subjects record was extracted for our study in which n=33 (44%) were males, and n=67 (67%) were females. The mean age of the participant was 18.32±4.19 years with maximum ranges from 15 and minimum to 12 years of age.

The results showed that the means of all vertical facial cephalometric parameters were in normal range(SNMP=32±4, FMA=25±4, MMA=25±, JarabicRatio =54±2, PFH/TAFH=65±4) representing an average facial pattern in patients with class II/I malocclusion. Table 2 shows the descriptive statistic of the study parameters.

There was a statistically nonsignificant correlation between overjet and vertical facial parameter. Pearson correlation between overjet and vertical facial morphology are shown table 3. Overjet was found to weak correlation with Steiner mandibular plane angle (r =0 .056), maxillary mandibular plane angle (r= 0.086), Frankfort mandibular plane angle (r=0.027), down y-axis (r=0.125),and lower anterior facial height to total anterior facial height (r=0.099) and weak negative correlation with Jaraback ratio. There was a strong correlation between Steiner mandibular plane angle, maxillary mandibular plane angle, Frankfort mandibular plane angle and down y-axis. .Mandibular plane angle had a strong positive correlation with Frankfort mandibular plane (FMA) angle (r=0.859**), maxillary mandible plane angle (r=.871**) and Steiner down Y-axis (r=.815**).

Arabic ratio was found to have a weak negative correlation with vertical facial parameters. There was a weak correlation between lower anterior facial height to total anterior facial height and another vertical facial parameter.

DISCUSSION

In orthodontics, proper assessment of vertical and sagittal relationship is important for an accurate diagnosis and treatment planning.Various diagnostic

Table 1: Cephalometric landmarks, angular and linear measurement.

Nasion (N)	The most anterior point on the frontonasal suture in the midsagittal plane
Sella(S)	The geometric center of the pituitary fossa.
Gonion(Go)	Constructed point at the intersection of the lines tangent to the posterior border of the ramus and the lower border of the mandible
Menton(Me)	Lowest point on mandibular symphysis
Gnathion(Gn)	The most anterior inferior point on the bony chin
Orbitale(Or)	Lowest point on the inferior rim of the orbit
Porion(Po)	Highest bony point on the upper margin of external auditory meatus
ANS	Anterior nasal spine, the anterior tip of the sharp bony process of the maxilla at the lower margin of the anterior nasal spine opening
PNS	Posterior nasal spine, the posterior spine of the palatine bone constituting the hard palate.
Steiner 's mandibular plane angle (S-N: Go –Me)	An angle formed between anterior cranial base and mandibular plane
Steiner's Y –axis (S-N-Gn)	An angle formed between anterior cranial base and the Y-axis
Frankfort mandibular plane angle(FMA)	An angle formed between Frankfort horizontal plane and mandibular plane.
Maxillary, mandibular plane angle(MMA)	An angle formed between the maxillary plane and mandibular plane.
Jarabak ratio	It's the ratio of posterior facial height to total anterior facial height.
LAFH-TAFH	It's the ratio of lower anterior facial height to total anterior facial height.

Table 2: descriptive statistic of age in years

Parameters	Mean	Std. Deviation	Minimum	Maximum
Age	18.32	4.19	12	29

Table3: Descriptive statistics of the study variables

Parameters	Minimum	Maximum	Mean	Std. Deviation
Overjet	5	28	8.04	2.651
S-N:Go_Me	17	60	33.28	7.653
FMA	10	59	26.86	8.446
MMA	10	55	26.64	7.898
Y-axis	55	84	68.29	5.145
Jarabic Ratio	43.00	78.60	64.1547	6.96036
Lafh-Tafh	47.50	67.70	56.5080	3.31713

Table 4: Correlations between Overjet and vertical cephalometric parameters

Person	Correlation	Overjet	SNMP	FMA	MMA	YAXIS	Jarabak Ratio	LAFH
Overjet	PC	1	.056	.027	.086	.125	-.010	.099
	Sig. (2-tailed)		.582	.791	.397	.214	923	.329
	N	100	100	100	100	100	100	100

**. Correlation is significant at the 0.01 level (2-tailed), *. Correlation is significant at the 0.05 level (2-tailed); PC, Pearson Correlation

Fig 1: Cephalometric landmarks

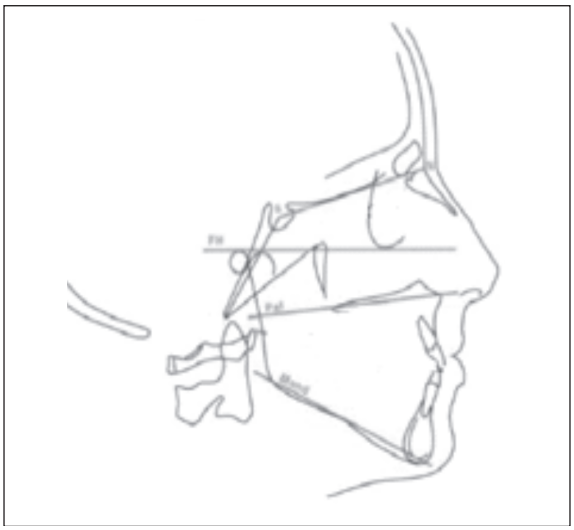

Fig 2: cephalometric angular measurement

Fig 3: Cephalometric linear measurement

records such as patient history, clinical examination, study cast analysis, cephalometric analysis, and photographs are required for an ideal treatment plan.[13]

As overjet is one of the parameters to evaluate sagittal relationship and is considered a good predictor of sagittal relationship in class II division I patients.[5]

The current study showed that there was a non-significant correlation between vertical facial morphology and overjet value in untreated class II division I malocclusion and overjet could not predict the vertical facial morphology in class II division I patients.

Bhateja NK[13] et al., 2015 conducted a study to examine the vertical facial morphology in untreated orthodontic patients with class II division I. They found an average vertical growth pattern, and there was an insignificant relationship between overjet and vertical cephalometric parameters. Our results were in agreement with their results except for Jaraback ratio in their results showed a tendency towards long facial pattern. Though in our results all the vertical cephalometric parameters were in the average range including jar back ratio.

In the current study to see the influence of age on vertical facial morphology, the whole sample was distributed in four ages group, group 1 (12-15 years), group 2 (16-20years), group 3(21-25 years), group 4(26-30 years).The mean of the all the study parameters were in normal range in all ages group except Jaraback ratio in group 4 showed a tendency towards short facial pattern. This refutes the statement given in various studies that anterior facial height tends to increase in the 3rd decade of life.

Sartaj et al.[1], 2012 evaluated in a study the correlation between vertical facial morphology and the sagittal relationship determined by overjet, wits appraisal, and ANB angle in patients with skeletal and dental class II malocclusion. They concluded that overjet value appears to a moderate significant predictor of vertical facial morphology in untreated class II patients. As the overjet increases, S-Go/N-Me, Sum (Bjork), Ar Go Me, Y-axis, S-N: Go-Me, PP: Go-Me and N Go Me increases and S –Go/N-Me and S-N: PP decrease.

Tanaka et al.[14] 2006 conducted a study to examine the correlation between wits and ANB in a sample of 118 untreated individuals divided into three groups accordingly to t he vertical facial pattern. They found a positive association between vertical facial pattern and

ANB and WITS (R=0.62) and concluded that the facial pattern does not have an influence on the correlation between ANB and AF-BF nor between ANB and Wits but it does have an impact on the measurements of ANB, AF-BF, and Wits.

Siriwat and jaraback[15] reported a neutral growth pattern was dominant in class II Division I malocclusion and hypo divergent pattern was in class II Division based on an association between facial height ratios.

Saltaji et[12], 2012 al examined the craniofacial morphology in three different overjet patterns; normal, increased and extreme overjet. They found a positive association between overjet value and the tendency towards a hyper divergent pattern. Subjects with normal overjet showed a horizontal facial pattern, increased overjet subjects exhibited a neutral facial pattern, and extreme overjet had a vertical facial pattern.

Although previous studies showed a positive association between sagittal pattern determined by overjet value and vertical skeletal cephalometric parameters, however, in this study, no significant correlation was found. The present report adds to Bhateja NK et al. study by identifying the similar associations between overjet value and parameters used to assess vertical facial morphology.

CLINICAL IMPLICATIONS

As overjet is not a predictor of vertical facial morphology, so proper cephalometric analysis of vertical skeletal parameters should be done along with overjet value by proper cast analysis in class II Division I patients for treatment planning.

CONCLUSION

Overjet is not a predictor of vertical facial morphology, and the age does not influence the vertical facial parameters.

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