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Original article

Determination of transverse discrepancies in class II division I malocclusion & class I occlusion- a comparative study

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ABSTRACT

Objectives: To evaluate the role of transverse discrepancy in the form of arch width, alveolar width andbuccolingual inclination of maxillary and mandibular posterior teeth between Class II division 1 malocclusion and Class I occlusion. **Materials and Methods:** Study consist of 25 subjects with Class I occlusion and 25 subjects with Class II division 1 malocclusion were selected to measure arch width & alveolar width with a standard caliper and Buccolingual inclination of maxillary and mandibular posteriors were measured with a bevel protractor. **Results:** Lingual tilted posterior teeth are seen in both the arches. The premolars and first molars of maxillary arch were significantly more lingually tilted (P< .05) in Class II division 1 malocclusion than in Class I occlusion, but in the mandibular arch first premolars were significantly less lingually tilted in Class II division 1 malocclusion than in Class I occlusion. No significant difference of Buccolingual inclination was found in mandibular second premolars and first molars between the two groups. No significant differences found between the groups with respect to arch width and alveolar width. **Conclusions:** Buccolingual inclination plays an important role in transverse discrepancy of Class II division 1 malocclusion, whereas no difference found with respect to arch width and alveolar width.

Introduction

Angle defined Class II malocclusion as characterized by a distal relation of the lower to the upper permanent first molar to the extent of more than one-half the width of one cusp and the maxillary incisors being protrusive[1]. The Class II malocclusion is a common malocclusion with a prevalence ranging between 5% and 29% [2-3]. Two thirds of the patients with Class II division 1 malocclusion were reported to have an associated significant skeletal discrepancy[3]. The dentoskeletal morphology of subjects exhibiting Class II malocclusion has been reported in several studies [4-6]

It's in the interesting for the orthodontist especially when formulating treatment planning to know the changes that occur in the arch form as growth or as a result of treatment per se.

In the recent past many studies have carried out extensive research in class II division I malocclusion in the transverse plane of occlusion. Results of these studies are more contradictory. Few studies suggested of narrower maxillary arch width in Class II

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malocclusion than in Class I or normal occlusion[7,8,9]. Whereas another study[10]found that there were no differences in maxillary arch width.

Some deficiencies existed in these studies. To mention few, most of the studies concerning transverse problems with Class II division 1 malocclusion were limited to arch width and alveolar width, neglecting another important transverse problem, the buccolingual inclination of posterior teeth. Studies showed that buccolingual inclination of posterior teeth was important not only to interdigitate occlusion, but also to frontal esthetics.[11]Another issue is with the inclusion criteria of Class II division 1 in these studies did not consider the skeletal relationship. As transverse discrepancy in Class II malocclusion might be compensation to anteroposterior displacement of jaws[7], the sagittal skeletal relationship should be considered in sample selection.

In our study Class II division 1 malocclusion, both in dental and skeletal relationships are considered. The aim of our research is to investigate, the role of arch width,alveolar width&buccolingual inclination between class II Division 1 malocclusion and class I occlusion.

Material & Methods

The study was carried out in the Department Of Orthodontics and DentofacialOrthopedics, A.M.E's Dental College and Hospital, Raichur, India. Study consisted of 50 subjects' dental impression and lateral Cephalogram in an age group of 14-20 years, which includes 25 class II malocclusion and 25 class I occlusion.

Materials used:

1. Patient's Casts
2. Lateral Cephalogram,
3. Digital Caliper
4. Bevel protractor

Inclusion criteria

Class II

(1) The mesial cusps of bilateral maxillary first molars were mesial to the centric groove of the corresponding mandibular first molars;

(2) Class II skeletal relationship with ANB angle >5 degree in cephalometric analysis;

(3) patients without orthodontic, prosthodontic, or orthognathic treatment;

(4) No severe crowding with Little's irregularity index of moderate irregularity (5-6mm).

(5) Nocrossbite, or scissor bite in the posterior teeth;

(6) Fully erupted first premolars, second premolars, and first molars;

Class I

(1) Bilateral Class I molars and canines in centric occlusion relationship;

(2) Class I skeletal relationship with ANB angle >0 &<5 in cephalometric analysis;

(3) Patients without orthodontic, prosthodontic, or orthognathic treatment;

(4) No severe crowding- Little's irregularity index of moderate irregularity (5-6mm),

(5) No crossbite, or scissor bite in the posterior teeth region.

(6) Fully erupted first premolars, second premolars, and first molars;

EXCLUSION CRITERIA

All conditions other than afore mentioned were excluded.

Methodology:-

Selected cast are duplicated with alginate. A reference plane, 'posterior occlusal plane' (POP) was established as done in a study by Rui Shu et al,[13]placing a flat plane on the most prominent cusps of posterior teeth, similarly one point on another side wall is marked. The bases of the casts were trimmed to the plane formed by the three points on the lateral wall, which was parallel to the POP. The facial axis of clinical crown (FACC) and its midpoint, the facial-axis point (FA point) point, are marked on the buccal surface and following measurements are performed

The buccolingual inclination of posterior teeth measurement was the buccolingual angle between teeth and the POP. The facial axis of clinical crown (FACC) and its midpoint, the facial-axis point (FA point) point, were marked on the buccal surface as described by Andrews and were used to measure the buccolingual inclination.

Intermolararch width is assessed by the FA point between of bilateral maxillary and mandibular first molars respectively, similarly on First and Second interpremolars arch width are measured respectively.

Maxillary alveolar width is considered between the mucogingival junctions below the FA point of bilateral first maxillary molars, first and second maxillary premolars repectively.

Mandibular alveolar width between the WALA point below the FA point of bilateral first mandibular molars, first and second premolars respectively assessed.

Paired t-test was applied for testing the difference of the arch width, alveolar width & buccolingual inclination between the left and the right side at each tooth category.

Independent t-test was applied for the comparison of arch width, alveolar width & buccolingual inclination between the Class I and Class II division 1 groups. Statistician is used to perform all of the statistical analyses.

RESULTS

Arch width, alveolar width and Buccolingual inclination data were recorded using Microsoft Office Exel™ 2013.

Comparison of arch width between the two groups is shown in Table 1. Although there was a tendency for the Class II group to have a narrow maxillary arch, there was no significant difference in arch width of maxillary and mandibular first molars, firstpremolars, and second premolars between the two groups.

Comparison of alveolar width between the two groups is shown in Table 2. The results are similar to those with arch width comparison. There was no significant difference in alveolar width of maxillary and mandibular first molars, first premolars, and second premolars between the two groups.

Comparison of the buccolingual inclination between the two groups is shown in Table 3. The Class II division 1 malocclusion samples had significantly more lingually tilted maxillary first molars, first premolars, and second premolars when compared to the Class I samples. It is also noticed that Mandibular first premolars were significantly less lingually tilted in Class II division 1 malocclusion than in the Class I samples. Whereas there was a tendency for mandibular second premolars and first molars of the Class II division 1 group to be less lingually tilted than the Class I group, but the differences showed no statistical significance.

Table 1: Comparison of the arch width {Mean (SD)} among both the groups using unpaired t test

MAXILLA

Group	No of samples	Mean (SD)		
		Max 1st Premolar	Max 2nd Premolar	Max 1st Molar
Class I	25	3.65 (0.3)	4.14 (0.2)	5.15 (0.4)
Class II	25	3.74 (0.3)	4.17 (0.1)	5.33 (0.4)
t value	-	0.752	0.447	1.087
P value	-	0.462	0.660	0.291

MANDIBLE

Group	No of samples	Mean (SD)		
		(Mand 1st Premolar)	(Mand 2nd Premolar)	(Mand 1st Molar)
Class I	25	3.40 (0.3)	3.84 (0.3)	4.58 (0.4)
Class II	25	3.58 (0.3)	3.91 (0.3)	4.64 (0.4)
t value	-	1.378	0.526	0.352
P value	-	0.185	0.605	0.729

Table 2 : Comparison of the alveolar width {Mean (SD)} among both the groups using unpaired t test

Group	No of samples	Mean (SD)	
		Maxillary arch	Mandibular arch
Class I	25	5.59 (0.7)	5.35 (0.8)
Class II	25	5.66 (0.6)	5.05 (0.5)
t value	-	0.239	1.043
P value	-	0.814	0.311

Table 3: Comparison of the bucco-lingual inclination {Mean (SD)} among both the groups using unpaired t test

MAXILLA

Group	No of samples	1st Premolar Mean (SD)		1st Molar Mean (SD)	
		Max right side	Max left side	Max right side	Max left side
Class I	25	10.10 (0.9)	10 (0.8)	7.90 (0.7)	8.40 (0.8)
Class II	25	14 (1.1)	13.20 (1.6)	10.30 (1.2)	10.10 (0.7)
t value	-	8.510	5.580	5.522	4.798
P value	-	<0.001**	<0.001**	<0.001**	<0.001**

(p < 0.05 - Significant*, p < 0.001 - Highly significant)**

Mandibular

Group	No of samples	1st Premolar Mean (SD)		1st Molar Mean (SD)	
		Mand right side	Mand left side	Mand right side	Mand left side
Class I	25	11.10 (0.9)	9.30 (1.1)	8.30 (0.8)	8.40 (0.8)
Class II	25	12.70 (0.9)	10.60 (0.8)	8 (0.8)	8 (0.8)
t value	-	3.919	3.036	0.818	1.078
P value	-	<0.001**	0.007*	0.424	0.295

(p < 0.05 - Significant*, p < 0.001 - Highly significant)**

Discussion

Andrew and Andrew suggested the use of an anatomic references, such as a parameter with the object of centralizing the roots of teeth in the basal bone, which they denominated via the WALA (Will Andrew & Larry Andrew) Ridge. The WALA ridge is strip of soft tissue immediately above mucogingival junction of the mandible, at the level of the line that passes through the centres of the rotation of the teeth or close to it and is exclusive to the mandible. By taking it as a base of study i.e relation between teeth and WALA ridge, standard distances were established between FA points and the WALA ridge which would influence the treatment plan.

A thorough knowledge of the skeletal and dental components that contribute to a malocclusion is essential as these elements may influence the treatment approach.Some reports have indicated that the maxilla in Class II division 1 patients was more protrusive and the mandible was normal in size and position.[14]Some studies found that the maxilla was in a normal position in relation to the cranial base while the mandible was retrusive[15]. Others found to have Class II skeletal pattern is due to both maxillary protrusion and mandibular retrusion[16].

ANB angle is a widely accepted diagnosis standard for sagittal jaw discrepancy and was employed in this research to investigate the relationship between transverse discrepancy and sagittal discrepancy.

The term inclination of teeth was first proposed in the six keys by Andrews[17]. In recent years, the buccolingual inclination of posterior teeth has become area of interest for researchers for its important role in smile esthetics and interdigitated occlusion. Lingual tilted posterior teeth would increase the negative corridor and consequently decrease the fullness of a smile. Because buccolingual inclination is another important transverse characteristic of occlusion, it is very important to identify the role of Buccolingual inclination in a transverse discrepancy in Class II division 1 malocclusion.

The POP was used as the reference plane mentioned by Jansonet al.[18]This reference plane was more accurate to reflect the aims of this study.

Our research which is similar to Rui Shu et al[13], the palatal tilt of the maxillary posterior teeth played the most important role in such compensation. The maxillary premolars and molars in a Class II division 1 malocclusion demonstrated significantly, greater lingual tilt than those in Class I occlusion. Differences in mandibular inclination seemed less significant. Mandibular first premolars were less lingually tilted in Class II division 1 malocclusion than in Class I occlusion, but there wasn't any significant difference observed in the mandibular second premolars and first molars. However, all mandibular posterior teeth showed a less lingual tendency, which was in accordance with the compensation hypothesis.

We concluded that amongst transverse discrepanciesbuccolingual inclination played a major role in Class II division 1 malocclusion. It's been attributed by clinicians that low tongue position, abnormal swallowing and sucking behaviours, nasal obstruction, finger habits & tongue thrusting were reasons for narrower maxillary dental arch widths in Class II division 1 malocclusions compared with a normal class I occlusion samples. Staley et al stated that the maxillary dental arch as a whole is narrower in adults with Class II division 1 malocclusion than it is in adults with normal occlusion. When we compare the dental and alveolar arch widths of Class II division 1 malocclusion samples with the normal occlusion samples, statistically

significant lower values were found in most of the upper arch widths in Class II division 1 patients. All upper alveolar width and interpremolar width measurements were greater in the normal occlusion sample. However, the intermolar dental arch width was larger in the Class II division 1 sample.Maxillary posterior teeth and mandibular posterior teeth have a correct buccal position to create a normal buccal overjet in normal occlusion.

Conclusion

Although the arch width and alveolar width undergoes changes from birth until mid-adulthood, the magnitude of changes in the arch width of posterior teeth does not have significant difference between class II and class I.

Similarly with the alveolar width of posterior teeth between Class II division 1 malocclusion and Class I occlusion does not show much of significance. Buccolingual inclination in maxillary posterior teeth are significantly tilted more in class II than in class I occlusion.

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