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Comparison of palatal depth and intermolar width in class I and class II div 1 malocclusion and in class II div 1 with hyperdivergent and hypodivergent pattern

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ABSTRACT

Objective: To compare the aligning efficiency, pain experienced by the patient during alignment and the post alignment third order values of anterior teeth in I arch (study) group and conventional NiTi (control) wire group.
Design: A prospective clinical study.
Materials and Methods: A total of 40 dental arches (maxilla/mandible) were divided into 2 study groups with 20 dental arches (maxilla/mandible) in each group based on the selection criteria. Group I. Twenty dental arches (maxillary/mandibular) having 0.018" preadjusted appliance (MBT) brackets (ORMCO), aligned with I –arch 0.016"x0.014" copper NiTi wires. Group II Twenty dental arches (maxillary/mandibular) having 0.018" preadjusted appliance (MBT) brackets by ORMCO aligned with round super elastic NiTi archwires.
Results: I -arch copper NiTi (study group) was more efficient in alignment compared to the superelastic NiTi (control group) in the lower arch and the values are statistically significant. There was torque expression in the I-arch group as compared to the superelastic NiTi group. The subjects in the I-arch (study group) experienced lesser pain compared to the superelastic NiTi (control group) and the pain values are statistically significant.

1. Introduction

Class II malocclusion is a common dental condition that can be categorized as either skeletal or dental, although a combination of both factors is often present.[1] In skeletal Class II malocclusion, the jaws are involved, while dental Class II malocclusion only affects the dentoalveolar region. This malocclusion can be associated with a retrognathic mandible, prognathic maxilla, or a combination of both.[1] The sagittal relationship of the molars and canines is distalized, leading to two clinical entities according to Angle's classification: Division 1 and Division 2.

In Class II Division 1 malocclusions, the upper incisors are labially inclined, resulting in an increased overjet.[2] The maxillary arch may be relatively narrow, and the vertical incisor overlap can vary from a deep overbite to an open bite. Some Division 1 cases exhibit a "V" shaped maxillary arch, while others show flaring and spacing of the maxillary incisors.[3]

Studies have shown that the growth patterns of the dental arch width and length are similar between the deciduous, mixed, and permanent dentitions in both normal subjects and those with Class II Division 1 malocclusions.[2] However, the differences in maxillary and mandibular intermolar arch widths are greater in normal subjects

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compared to those with Class II Division 1 malocclusions.[3] This relative constriction of the maxillary arch in Class II malocclusions is evident from the early stages of dental arch development.[4]

Class II malocclusions with anteroposterior skeletal discrepancies are characterized by a large ANB angle and Wits Appraisal, reflecting the misalignment between the maxilla and mandible. These discrepancies can also be accompanied by a vertical discrepancy, such as a relatively long or short anterior face.[5]

Palatal morphology plays a significant role in defining the skeletal and facial patterns of an individual. Different individuals have variations in palatal height, width, and length. Orthodontic treatment can also influence palatal dimensions. Studies have reported that subjects with Class II Division 1 malocclusion have greater palatal height and a narrower maxillary dental arch.[6]

Despite the importance of palatal morphology in understanding malocclusions, there is a lack of readily available investigations on palatal dimensions. Therefore, the purpose of the study is to evaluate palatal morphology in common malocclusion groups, including Class I and Class II Division 1 malocclusions, as well as Class II Division 1 with hyperdivergent and hypodivergent patterns. Intermolar width is measured from the lingual groove at the cervical line of maxillary intermolar distance. It should be between 34 and 38mm.

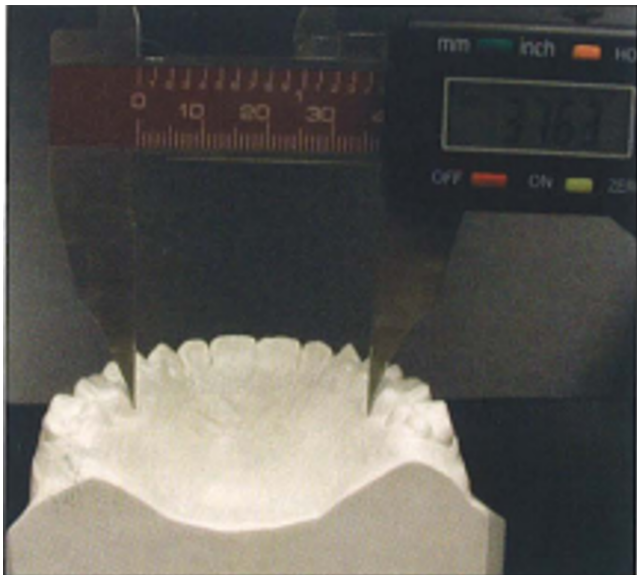


Fig. 1: Measurement of intermolar width

2. Materials and Methods

The present study is an observational, descriptive, cross-sectional study carried out on 60 pre-treatment study models of patients in which 30 models of Class I and 30 models of Class II were measeured.15 cases of each Hyperdivergent and Hypodivergent cases were also evaluated

All the subjects included in the study exhibited a Class I molar and canine relationship with Normodivergent pattern and class II molar and canine relationship with Hyper and Hypodivergent pattern and an overjet of 4-5 mm at minimum revealed by the cephalometric radiographs.

Selection criteria for Class II Division 1 sample were:

In the study, the selection criteria for the Class II Division 1 sample included the following criteria:

1. ANB angle greater than 4 degrees.
2. Overjet greater than 4 mm.
3. Bilateral Class II molar in centric occlusion.
4. Permanent dentition with no missing teeth (except third molars).
5. Convex facial profile.
6. No previous orthodontic treatment.
7. No cleft lip/palate and/or other craniofacial syndromes.

To measure palatal height, the Vernier caliper was used to determine the vertical distance between the depth of the palate and the occlusal surface at the first molar region. This measurement provides information about the vertical dimension of the palate.For intermolar width measurement, the Vernier caliper was positioned on the palatal groove between the left and right first molars. The horizontal distance between these two points was measured, indicating the width of the palate in the molar region. The vertical distance between depth of palate and occlusal surface at first molar region was measured using metallic scale and depth rod of Vernier caliper.

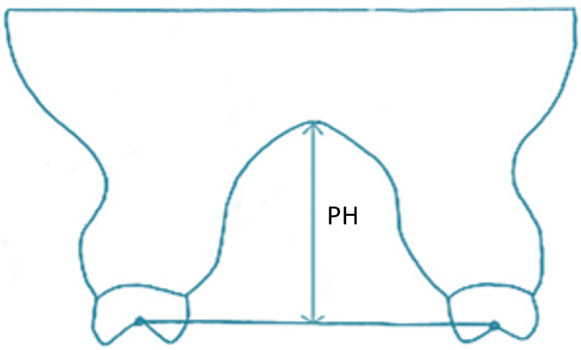


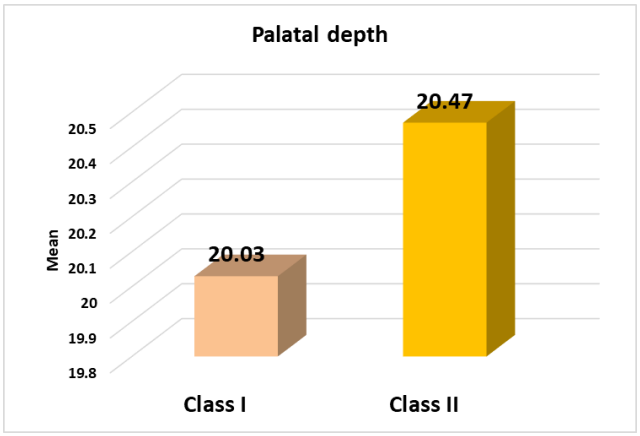
Fig. 2: Palatal height (PH): measure as the distance of the perpendicular line from the connecting line between midpoints of the fissures of upper molars to the surface of the palate

3. Results

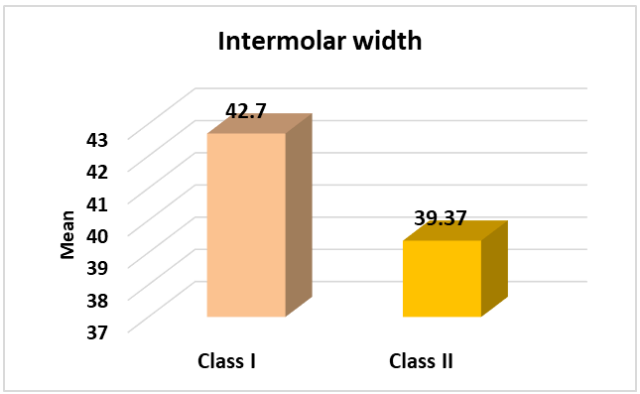
3.1. Data analysis

Data was entered into Microsoft Excel spreadsheet and was checked for any discrepancies. Summarized data was

presented using Tables and Graphs. The data was analyzed by SPSS (21.0 version). Shapiro Wilk test was used to check which all variables were following normal distribution. Data were not normally distributed (p-value was more than 0.05). Therefore, bivariate analyses were performed using the parametric tests i.e independent t test (for comparing two groups). Level of statistical significance was set at p-value less than 0.05



Graph 1: Comparison of meanpalatal depth among subjects with class I and class II



Graph 2: Comparison of mean intermolar width among subjects with class I and class I

4. Discussion

In the present study No significant difference was seen in mean palatal depth among subjects having class I and class II relationship when compared using independent t test as p>0.05. Mean intermolar width was found to be significantly more in Class I subjects as compared to class II subjects and no significant difference was seen in mean intermolar width and palatal depth of class II subjects having vertical or horizontal growth pattern. These findings are in accordance with the study of Buschang et al., Patel et al., Islam et al. and Acharya et al.[2]

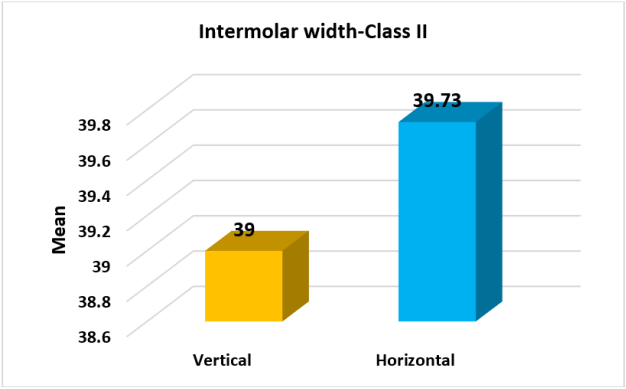


Fig. 3: Comparison of intermolar width in class II subjects having vertical and horizontal growth pattern

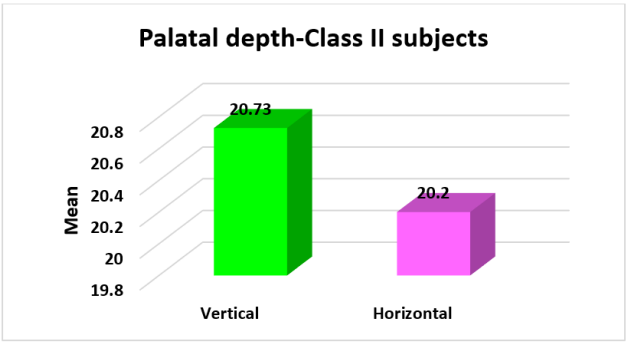


Fig. 4: Comparison of palatal depth in class II subjects having vertical and horizontal growth pattern

This result can be explained by the fact that the aetiology of Class II malocclusion is related to mandibular retrognathism, maxillary prognathism or the combination. Nasal obstruction, lower tongue position, finger sucking, tongue thrusting, abnormal sucking or swallowing habits are also considered to be the reason for narrow arch in Class II Division 1 malocclusion.[4] Palatal height was lesser in Class II Division 1 malocclusion with no significant difference. These findings were in accordance with the study done by Nahidh et al.[6] Many factors like heredity, growth, eruption pattern, teeth inclination, external environmental influence and ethnicity affect size of the dental arches. Assessment of arch dimensions is significant in diagnosis and treatment planning, and predicting the treatment outcome. Hence, it is essential for an orthodontist to be acquainted with usual growth and development of the dentition and dental arch.[7]

5. Conclusion

Mean intermolar width was found more in Class I patients when compared to Class II patients but no significant difference was found in palatal depth also No significant

Table 1: No significant difference was seen in mean palatal depth among subjects having class I and class II relationship when compared using independent t test as p>0.05

	Group	N	Mean	Std. Deviation	
Palatal D epth	Class I	30	20.03	1.866	.341
	Class II	30	20.47	2.300	.420
P value			0.426, ns		

Table 2: Mean intermolar width was found to be significantly more in Class I subjects as compared to class II subjects

	Group	N	Mean	Std. Deviation	Std. Error Mean
Intermolar width	Class I	30	42.70	3.515	.642
	Class II	30	39.37	4.038	.737
P value			0.001*		

Table 3: No significant difference was seen in meanintermolar width of class II subjects having vertical and horizontal growth pattern

	Growth	N	Mean	Std. Deviation	Std. Error Mean
Intermolar width	Vertical	15	39.00	5.113	1.320
	Horizontal	15	39.73	2.712	.700
P value					0.627, ns

Table 4: No significant difference was seen in mean palatal depth of class II subjects having verticaland horizontal growth pattern

	Growth	N	Mean	Std. Deviation	Std. Error Mean
Palatal depth	Vertical	15	20.73	2.658	.686
	Horizontal	15	20.20	1.935	.500
P value					0.535, ns

difference in palatal depth and intermolar width was found in Class II patients with Hyperdivergent and Hypodivergent pattern.

Palatal morphology should be considered in diagnosis and treatment planning of different malocclusions as it can affect the treatment outcome and its stability.

6. Source of Funding

None.

7. Conflict of Interest

None.

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