COMPARISON OF DENTAL ARCH CHANGES IN PATIENTS UNDERGOING EXTRACTION AND NON-EXTRACTION TREATMENT FOR THE CORRECTION OF CLASS I AND CLASS II MALOCCLUSION

Dr. Mohammed Safvan M A, Postgraduate, Department of Orthodontics and Dentofacial Orthopedics, Yenepoya Dental College, Yenepoya (Deemed to be University), Mangalore

Dr. Sandeep Shetty, Professor and Head, Department of Orthodontics and Dentofacial Orthopedics, Yenepoya Dental College, Yenepoya (Deemed to be University), Mangalore

Dr. Mohamed Parvaize, Postgraduate, Department of Orthodontics and Dentofacial Orthopedics, Yenepoya Dental College, Yenepoya (Deemed to be University), Mangalore

Dr. Shahir Backer, Consultant Orthodontist, Carewell Dental Clinic, Kannur, Kerala

Dr. Subramanya Shetty, Professor, Department of Orthodontics and Dentofacial Orthopedics, Yenepoya Dental College, Yenepoya (Deemed to be University), Mangalore

Corresponding author: Dr. Mohammed Safvan M A, Postgraduate, Department of Orthodontics and Dentofacial Orthopedics, Yenepoya Dental College, Yenepoya (Deemed to be University), Mangalore

Abstract

Objective: To compare pre-treatment and post-treatment dental arches in relation to intercanine and intermolar width changes in extraction and non-extraction treatment in class I and class II cases. **Materials and methods**: This retrospective study was conducted in the department of Orthodontics and Dentofacial Orthopaedics, Yenepoya Dental College, Yenepoya (Deemed to be University), Mangalore. Forty-four study models were selected randomly for this study based on the inclusion and exclusion criteria.Inter canine and intermolar width were measured using digital Vernier Calliper in extraction and non-extraction Class I and Class II groups. **Results:** The intercanine width was significant only in extraction group of Class II and insignificant in all other groups of class I and Class II. The intermolar width showed significant changes in Class I groups in both extraction and non-extraction while only non-extraction had significant change In Class II groups. **Conclusion**: There is no significant changes observed in extraction and non-extraction treatment protocol, but there were differences between the class I and class II cases. The increase in the arch width was significantly more whether its ICW or IMW in class II cases than in class I cases.

Keywords: Intercanine width, Inter molar width.

Introduction: There are numerous classifications of malocclusion and one classification which has stood over time is by Angle in which he classified Malocclusion based on molar relation into Class I, Class II, and Class III.There are two schools of thought in comprehensive orthodontics when it comes to treatment plan, Correction by extraction or by Expansion. The treatment plan is chosen depending on the age of the patient, severity and type of malocclusion and stability of the corrected malocclusion[1].

There are multiple permutation and combination of extraction pattern available for different clinical situation. When it comes to extraction, the most commonly extracted are first premolars followed by second premolars. In rare occasions molars or sometimes even incisors are extracted.

In non-extraction treatment modalities space is usually available, for example in patients with spacing. In other cases where spacing is not evident, space required can be achieved by distal movement of the posterior teeth, proclination of the anterior teeth, and by expansion of arch.

One of the criticisms of extraction treatment is that it results in narrower arches when compared to non-extraction treatment. It is believed that the pre-treatment values of inter-canine and inter-molar widths present a position of muscular balance so it is suggested that the maintenance of these values provide with utmost post retention stability[2].

The relationship between the transverse dimension and the correction of Class II malocclusion was explained earlier by Reichenbach and Taatz in 1971[3]. This author presents some findings that prove the relationship between the increase in transverse palatal diameter and the correction of sagittal discrepancies, and they explained this concept by describing the example of a foot and a shoe, which represented the mandible and maxilla. If shoe is too small, the foot will not fit completely in the shoe. If shoe is wider, the foot moves forward into a comfortable position. This example explains how palatal transverse expansion solves spontaneous mandible repositioning in a forward position and improving sagittal discrepancy[4].

Thus, measuring and comparing the inter-canine and intermolar width helps to access the post treatment stability in these two treatment modalities. Study models which are inevitable diagnostic aid, is the most available aid to measure these parameters. This study was aimed at comparing pre-treatment and post-treatment dental arches in relation to

intercanine and intermolar width changes in extraction and non-extraction treatment in class I and class II cases.

Materials and methodology: This retrospective study was conducted in the department of Orthodontics and Dentofacial Orthopaedics, Yenepoya Dental College, Yenepoya (Deemed to be University), Mangalore. Ethical clearance was obtained from the Yenepoya (Deemed to be University) Ethics Committee 2.

Inclusion criteria

- Class I and class II extraction cases
- Class I and class II non extraction cases

Exclusion criteria

- Congenital anomalies
- Facial asymmetry
- Congenitally missing teeth
- Cleft lip and palate
- Missing first molars, premolars and canines

Forty-four study models were selected randomly for this study based on the inclusion and exclusion criteria. Each dental study models were evaluated for accuracy and segregated into the following groups depending on the malocclusion and extraction pattern.

Class I	Class II
Extraction group =11	Extraction group =11
Non extraction group =11	Non extraction group =11
TOTAL= 22	TOTAL = 22
Total sample size will be = 44	

The following measurements for 2 groups were done by the principal investigator.

- The inter canine width and inter molar width was measured in the pre-treatment and post treatment dental casts with a vernier calliper.

Procedure for Class I extraction and Non extraction

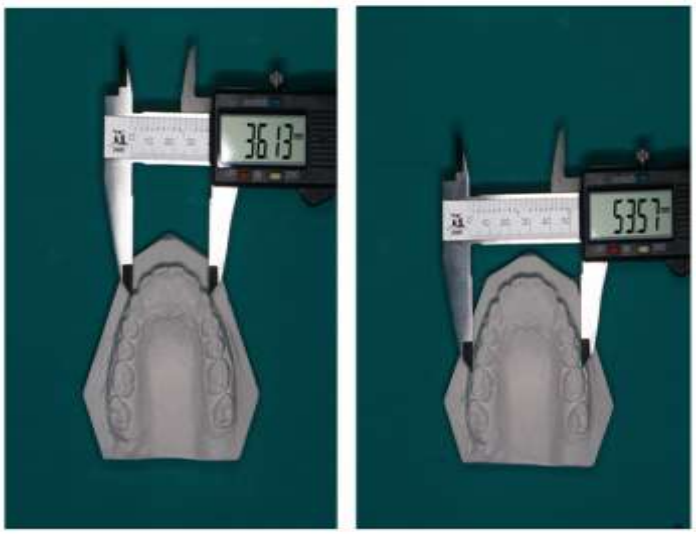
- Dental models of Class I malocclusion were selected.
- The inter canine width was measured between the canine cusp tips.
- The inter molar width was measured from mesiobuccal cusp tips of first permanent molars.

- The statistical correlation between the pre-treatment and post treatment measurements in extraction and non-extraction cases were analysed.

Procedure for Class II extraction and Non extraction

- Dental models of Class II malocclusion were selected.
- The inter canine width was measured between the canine cusp tips.
- The inter molar width was measured from mesio-buccal cusp tips of first permanent molars.
- The statistical correlation between the pre-treatment and post treatment measurements in extraction and non-extraction cases were analysed.

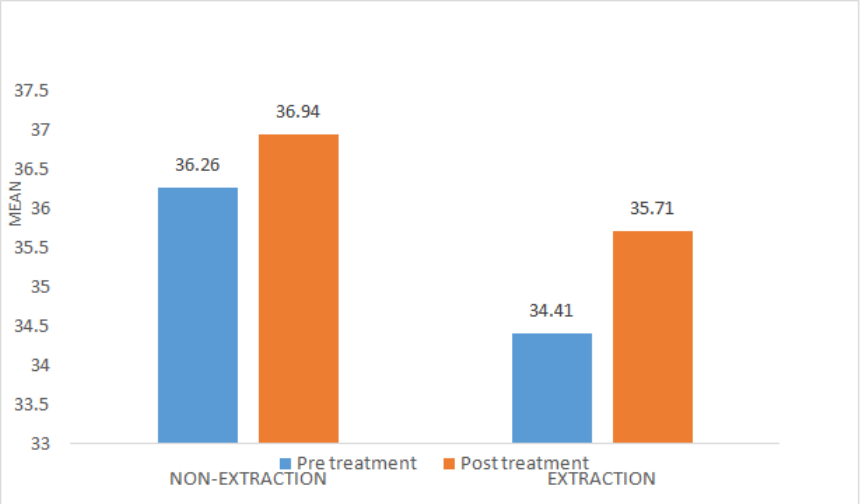
Figure 1: Measurement of inter canine and intermolar width



Statistical analysis: The descriptive statistics was used and the collected data were analysed in the SPSS software (IBM, Chicago, IL, version 25.0). Mean and Standard deviation was calculated for continuous data. The frequency and percentage for categorical data was used. Independent sample t test was used for comparison of two groups.

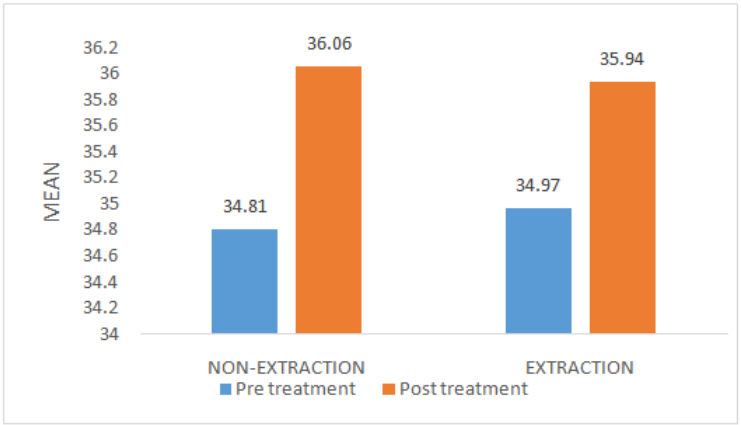
Results: On comparing the intercanine width between class I extraction and non-extraction groups, the results are statistically insignificant. The post treatment inter-canine width is more 36.94±2.13 compared to pre-treatment 36.26±1.91 in non-extraction group. But the difference is not significant with p value of 0.188. The post treatment inter-canine width is more 35.71±2.39compared to pre-treatment 34.41±2.79 in extraction group. But the difference is not significant with p value of 0.124 (graph 1).

Graph1: Comparison of class I intercanine width between the groups



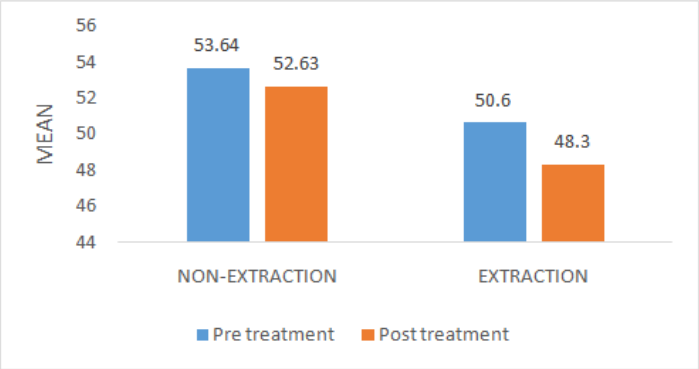
On comparing the intercanine width between class II extraction and non-extraction groups, the results are statically insignificant in non-extraction group, while changes are statistically significant in extraction group. The post treatment inter-canine width is more 36.06± 1.31 compared to pre-treatment 34.81± 2.91 in non-extraction group. But the difference is not significant with p value of 0.142. The post treatment inter-canine width is more 35.94± 2.59 compared to pre-treatment 34.97± 2.84 in extraction group. difference is significant with p value of 0.015(graph 2).

Graph 2: Comparison of class II inter canine width between the groups



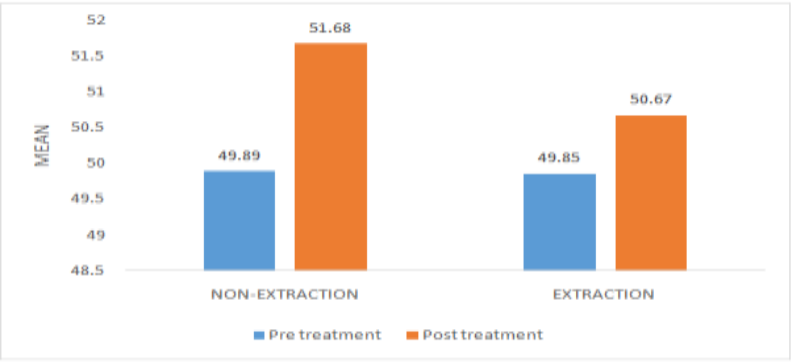
On comparing the intermolar width between class I extraction and non-extraction groups, the results arestatically significant in both extraction and non-extraction groups. The pre and post alignment inter-molar width for non-extraction is 53.64± 3.29 and 52.63± 2.69 respectively, which is significant with p value of 0.004.The pre and post alignment inter-molar width for extraction is 50.60± 3.80 and 48.30± 2.74 respectively, which is significant with p value of 0.002(graph 3).

Graph 3:Comparison of class I inter molar width between the groups



On comparing the intermolar width between class II extraction and non-extraction groups, the results are statically significant in non-extraction group while they did not differ statistically in extraction group. The pre and post alignment inter-molar width for non-extraction is 49.89± 3.41and 51.68± 3.08 respectively, which is significant with p value of 0.010**.** The pre and post alignment inter-molar width for extraction is 49.85± 3.30and 50.67± 1.96 respectively, which is not significant with p value of 0.126 (graph 4).

Graph 4: Comparison of class II inter molar width between the groups



On comparing the intercanine width between class I and class II non-extraction groups, the results are statically insignificant (graph 5).

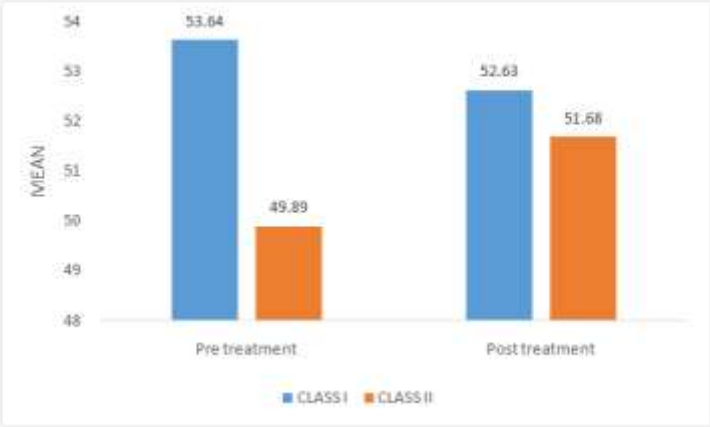
Graph 5: Comparison between class I and class II inter canine width in non-extraction group

On comparing the intercanine width between class I and class II extraction groups, the results are statically insignificant (graph 6).

Graph 6: Comparison between class I and class II inter canine width in extraction group

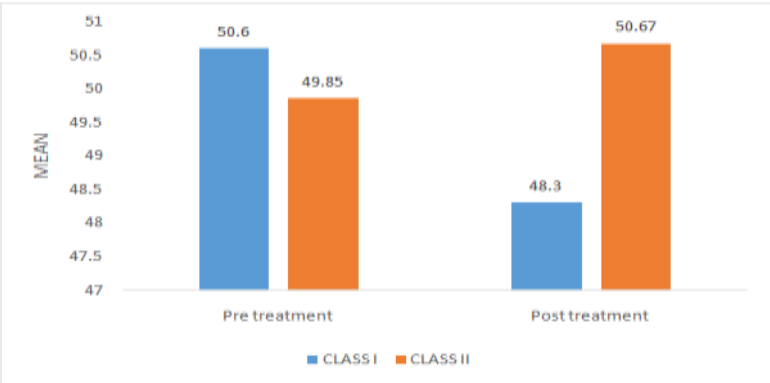
On comparing the intermolar width between class I and class II non-extraction groups, the results are statically insignificant (graph 7).

Graph 7: Comparison between class I and class II inter molar width in non-extraction group



On comparing the intermolar width between class I and class II extraction groups, the results are statically insignificant (graph 8).

Graph 8: Comparison between class I and class II inter molar width in extraction group



Discussion: Maxillary transverse growth is first to seize in the orofacial region compared to sagittal and vertical dimensions, and it is one of the most common skeletal problems faced by orthodontists in their day today clinical practice, but they are not quantified most of the time[2]. Comparing the approaches often taken in treating skeletal based problems in anteroposterior and vertical dimension, earlier many orthodontists have been reluctant to change arch dimensions transversely. Most of the transverse skeletal problems in the maxilla are ignored or simply not recognized, and thus the treatment options for such patients are more limited than discrepancies in the sagittal and vertical dimensions[5].

Other than crossbite, two of the most common problems faced by the orthodontist are crowding and proclination of the teeth, both of which are due to imbalance between the tooth size and the size of the skeletal bases. Previous studies have shown that dental crowding, appears to be related more to a deficiency in arch perimeter than to teeth that are too large in size. A primary factor in dental crowding often is maxillary transverse or sagittal deficiency[6]. If the position of the maxillary dentition does not compensate the skeletal discrepancy, crossbite results; on the other hand, if maxillary constriction is camouflaged or compensated by the dentition, and both dental arches are constricted, crowding in the absence of crossbite is observed[7].

For almost a century, the use of extractions to treat malocclusions has been debated in orthodontic circles. There are significant differences between the extraction and non-extraction groups, specifically changes in incisor, canine, premolar and molar widths as well as changes in posterior arch length and tooth size arch length discrepancies. The general trend is decrease in anterior and posterior arch length and an increase in TSALD (tooth size-arch length discrepancies). First-premolar extraction treatment is synonymous with narrow dental arches with consequent unesthetic, large black triangles in the buccal corridor[8].

This is a retrospective study aimed at assessing the transverse changes in intercanine and intermolar region before and after treatment on 44 dental models of treated class I and class II cases with both extraction and non-extraction treatment protocol.

When comparing intercanine width of class I cases treated with extraction and non-extraction protocol, it shows there is an increase in the measurements in both the groups which shows that there is certain amount of expansion occurring in the arch while undergoing the treatment[9].

In contrast while comparing the intercanine width in class II extraction and non-extraction cases it also shows there is expansion occurred during the treatment but in contrast with the class I group the values are more in class II group. The reason for this may not be

only the expansion achieved during the treatment also it can be because of the fact that maxillary transverse discrepancy is commonly present in a class II malocclusion. Tollaro et al have shown that there will be underlying transverse discrepancy of 3 to 5 mm in dental arches with Class II malocclusion and seemingly normal buccal relationships. This underlying transverse discrepancy can be unmasked clinically by having the patient posture the mandible in an anterior position so that the canines are positioned in a Class I relationship[10].

While comparing the intermolar width in class I patient treated with extraction and non-extraction protocol both the groups showed there is decrease in the intermolar width, whereas in the case of class II cases in both extraction and non-extraction group shows increase in the intermolar width the reason for this might be the same as explained before in the expansion of intercanine width in class II cases.

Conclusion

- The intercanine width was significant only in extraction group of Class II and insignificant in all other groups of class I and Class II.
- There was significant change in the pre and post treatment groups of both extraction and non-extraction in Class I cases with respect to their inter molar width with p value of 0.002 and 0.004 respectively.
- Significant changes were observed in intermolar width of non-extraction group of Class II cases withp value of 0.010, while the changes were insignificant in the extraction group.
- The intermolar width showed significant changes in Class I groups in both extraction and non-extraction while only non-extraction had significant change in Class II groups.

To conclude, there was no significant change observed in extraction and non-extraction treatment protocol, but there was difference between class I and class II cases. The increase in the arch width was significantly more whether its ICW or IMW in class II cases than in class I cases.

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