Intercanine Arch Width Changes in Class I Malocclusion Individuals Following Orthodontic Treatment

Dental Science

Dr.Praveen M.N	M.D.S Reader, Department of orthodontics and Dentofacial Orthopaedics K.L.E'S Dental College and Hospital, Bangalore, Karnataka
Dr.Sweta Ramrao Tamewar	(M.D.S) PG Student,Department of orthodontic and Dentofacial Orthopaedics P.M.N.M.Dental College and Hospital , Bagalkot, Karnataka
Dr. Kirankumar B.D	MDS, Reader, Navodaya Dental College & Hospital, Raichur
Dr. Jayachandra M.G	Professor & Head of Department, Department of Public Health Dentistry, SJM College of Dentistry, Chitradurga
Dr. Abhinav Parakh	Senior Resident, Department of Public Health Dentistry, Government Dental College & Hospital, Raipur, Chhattisgarh

ABSTRACT   **Aims and objectives:** The aim and objective of this observational study was to evaluate the dental arch width changes in Angle Class I malocclusion of all four first premolar extraction cases treated with MBT PEA mechanotherapy. **Materials and Methods:** The study was performed on pre treatment and post treatment study models of 20 subjects. The intercanine arch width measurements were measured using a digital calliper of 0.01 accuracy. Paired samples t-test was used to evaluate the treatment changes within each group. **Results:** Mandibular intercanine widths were increased but the values were statistically insignificant. There was a statistically significant increase in Maxillary intercanine arch width from 35.08+ 3.08 mm to 36.573+ 2.26 mm (t = -2.501 P <0.02) **Conclusions:** The intercanine distance increased in maxillary arch and the difference was statistically significant.

Introduction:

The size and shape of the arches have considerable implications in orthodontic diagnosis and treatment planning, affecting the space available, dental esthetics and stability of the dentition. The changes in the dental arch dimensions that occur as a result treatment are of interest to the orthodontist and require careful consideration during treatment planning.[1,2].

Transverse or vertical arch mal-relationships such as crowding and local irregularities are common features of Class I malocclusions and are handled usually by extraction or non-extraction treatment in the permanent dentition.[3]

It is well observed that increase in dental arch length and width during orthodontic treatment tends to return toward pre-treatment values after retention. The maintenance of the pre-treatment values for inter-canine and inter-molar distances was suggested as the key to post-treatment stability because these values were believed to represent a position of muscular balance for the patient[4,5]. The mandibular inter-canine width dimensions show a strong tendency to relapse and should be considered inviolate.

Aim and Objective

The aim and objective of this observational study was to evaluate the inter canine arch width changes in Angle's Class I malocclusion extraction cases treated with PEA appliance.

Methodology

The study conducted in the Department of Orthodontics and Dentofacial Orthopedics, .M.S.R Dental College and Hospital Bangalore. Pre-treatment and Post-treatment study models of patients reported to the Department of Orthodontics and Dentofacial Orthopedics requiring orthodontic treatment with PEA mechanotherapy were selected . Total 20 subjects study casts fulfilling the inclusion criteria are taken for the study. All the cases treated with fixed PEA mechanotherapy are considered.

The following inclusion criteria were adapted

1. Subjects with good general health and absence of nutritional problems.
2. Patient Age; 14 to 25 years
3. Both sexes are included.
4. Angle's class I malocclusion cases

5. All four first Premolar extraction cases

The following exclusion criteria adapted

1. Patients who are having history of past orthodontic treatment.
2. Patients having impacted, transposed and Ectopically erupted Canines.
3. Patients having mal-posed anterior teeth.
4. Patients having mixed dentition.
5. Any missing permanent anterior teeth or congenitally absent teeth.

Materials:

Study models of pre-treatment and post-treatment cases treated with MBT PEA prescription were used. For measurement of data Digital vernier caliper with accuracy of 0.01 mm was used.

Method:

The intercanine widths of the maxillary and mandibular dental arches were measured using a ISO digital calliper (Aerospace from Libral) with accuracy of 0.01 mm. It was done by measuring Inter-canine arch width the distance between tip of the canines in an arch, and the caliper was placed at the best estimate of a right angle to the palatal suture in the maxillary arch and to a line bisecting the incisor segment in the mandibular arch. (Fig1 and 2)

Figure -1, Aerospace 150mm Digital Caliper

Figure 2, Method of measuring Maxillary Intercanine Width Results

All the data was entered into Microsoft Excel and analyzed using SPSS software package (Version 16.0). For each variable, the arithmetic mean and standard deviation were calculated.

Statistical tests performed are Paired samples t-test which was used to evaluate the treatment changes within each group. The Paired-Samples t Test procedure compares the means of two variables for a single group. The procedure computes the differences between values of the two variables for each case and tests whether the average differs from 0.

Table 1 depicts the gender wise distribution of the subject. The majority of the study subjects are female comprising 60% of the total subjects.

**Table 1 Comparison of Study groups according to Sex**

Study groups	Male (%)	Female (%)	Total
Extraction Class 1	08 (40%)	12(60%)	20(100%)

In table 2, Paired t test was used to compare the pre-treatment & post treatment arch widths differences in extraction cases of the maxillary and mandibular arch. There was a statistically significant increase in Maxillary intercanine arch width from 35.08+ 3.08 mm to 36.573+ 2.26 mm   (t = -2.501 P <0.02) . These values are represented by Graph 1

Table 2 Comparison of Pre and Post treatment Maxillary and Mandibular Intercanine Arch Widths (mm)

Extraction	Pre-treatment (Mean +S.D)	Post-treatment (Mean +S.D)	Statistical analysis		
(Widths in mm)			Mean Diff.	t value	P value
Maxillary intercanine width	35.08 ± 3.08	36.573 ± 2.26	-1.493	-2.501	0.021*
Mandibular Intercanine width	26.361 ± 2.87	28.327 ± 2.133	-1.966	-5.2386	4.67

***Significant**
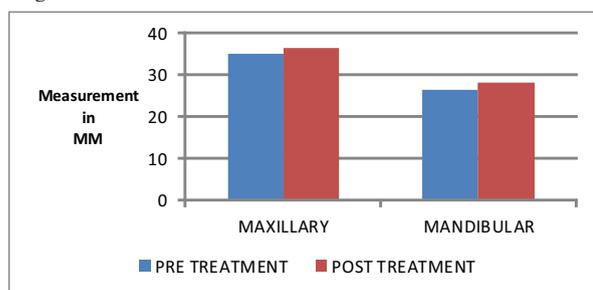
Graph1; - Comparison of Pre& Post-Treatment Maxillary and Mandibular Intercanine arch width

Discussion

The present study was done to know the intercanine width changes that occurred due to orthodontic treatment in an Angle's class I malocclusion treated with PEA mechanotherapy in extraction cases involving of all first pre-molars extraction cases.

Out of 20 samples in the study (Table 1), 8 were males and 12 were females.   As per the study of Ward DE et al6, sex has no statistically significant effect on these treatment difference. This is also supported by the study of Bishara SE et al who stated as post-treatment changes were similar in males and females[7]. As stated by Ward DE et al[6] "Type of orthodontic treatment had no effect on intercanine width changes within the treated group; however, the

effect of tooth extraction needs further investigation, hence the present study is done to verify the changes due to the effect of tooth extraction in the treated extraction group using uniformity in appliance selection; that is PEA appliance.

Pre-treatment and post-treatment maxillary and mandibular intercanine arch width in extraction cases were compared (Table 2 and graph 1) and analyzed. The results of this study indicate that there was a statistically significant increase in Maxillary canine arch width from 35.08+ 3.08 mm to 36.573+ 2.26 mm in the extraction cases (P <0.02) . There was increase in intercanine widths in mandibular arches in the extraction cases, but the overall values were statistically insignificant. In the study of Boley et al[8], the interarch changes of four premolar extraction cases were evaluated. According to their findings, maxillary intercanine widths increased 1 mm and the corresponding mandibular arch width increased 1.7 mm during treatment. Maxillary and mandibular intermolar widths decreased 1.7 and 2.1 mm respectively. These findings are in accordance with the work of this study.

The intercanine   widths were measured on pre-and post treatment 20 study samples with Aerospace ISO digital calliper as per the original work of Aksu M et al, [3] where the study consisted of two groups, extraction and nonextraction. The extraction group consisted of 30 samples in which all the first premolars were extracted as a comprehensive orthodontic treatment planning. The digital caliper proved to be superior, a more suitable instrument for scientific work and measurement with digital calipers on plaster models showed the highest accuracy and reproducibility, closely followed by OrthoCAD[9].

Conclusion

The present study concluded that intercanine width tends to increase in MBT PEA mechanotherapy. Intercanine arch widths were increased in both maxillary and mandibular Class I patients treated by PEA prescription, but the increased values were statistically insignificant in mandibular arch. The intercanine width increased in maxillary arch   and the difference was statistically significant.

References
1. Steadman SR. Changes of intermolar and intercuspid distances following orthodontic treatment. Angle Orthod 1961;31:207–215.
2. Little RM, Wallen TR, Riedel RA. Stability and relapse of mandibular anterioralignment-first premolar extraction cases treated by edgewise orthodontics. Am J Orthod 1981;80:349–365.
3. Aksu M, Kocadereli I. Arch Width Changes in Extraction and non-extraction Treatment in Class I Patients. Angle Orthod 2005;75: 948-952.
4. Riedel RA. Review of the retention problem. Angle Orthod 1960;6:179–199.
5. Strang RHW. Factors associated with successful orthodontic treatment. Am j Orthod 1952;38:790–800.
6. Ward DE, Workman J, Brown R, Richmond S. Changes in Arch Width - A 20-year Longitudinal Study of Orthodontic Treatment Angle Orthod 2006;76:6–13.
7. Bishara SE, Bayati P, Zaher AR, Jakobsen JR. Comparisons of the dental arch changes in patients with Class II, division 1 malocclusions: extraction vs nonextraction treatments. Angle Orthod 1994;5:351–358.
8. Boley JC, Mark JA, Sachdeva RCL, Buschang PH. Long-term stability of Class I premolar extraction treatment. Am J Orthod Dentofacial Orthop 2003;124:277-287.
9. Zilberman O, Huggare JAV, Parikakis KA. Evaluation of the Validity of Tooth Size and Arch Width Measurements Using Conventional and Three-dimensional Virtual Orthodontic Models. Angle Orthod 2003;73:301–306.