

Mandibular intercanine width in pre and mid orthodontic treatment in extraction and non-extraction cases

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Abstract

Introduction: Arch width changes during orthodontic treatment. Maintaining of pre-treatment intercanine width reduces the risk of relapse and increases the chance of stability. The ideal would be to reproduce the patient original arch form. The aim of this study was to investigate mid treatment mandibular intercanine width changes in the extraction and non-extraction cases.

Material and methods: The sample consisted of 61 consecutive orthodontic patients (29 extractions and 32 non extractions). 27 Patients were males (44.4%) and 34 females (55.7%). The mean age of the sample was (20.11± 4.6 years). The intercanine width was measured on plaster casts (pre and mid treatment) from the cusp tip of the canine using a digital vernier caliper.

Results: Mean value of the intercanine width in non-extraction group was 26.5± 1.74 ,27.07± 1.76 respectively. The mean Inter canine width pre and mid treatment in extraction group was 26.7±2.32, 27.54 ± 2.36, respectively. Mandibular inter canine widths increases in mid treatment in both groups. Mandibular intercanine widths showed no significant difference between the two treatment groups.

Conclusions: Mandibular intercanine width increases in both groups. There is no significant difference observed between the groups.

Keywords: Arch width changes; mandibular arch; orthodontic treatment.

Introduction

Arch dimensional changes during orthodontic treatment is a topic of interest to the orthodontist.^{1,2,3} The stability of arch dimension has been reported to be important for both practitioner and the patient.^{4,5,6} It is well established that there are chances of increase in intercanine width during orthodontic treatment.^{7,8} Hence, in such cases, it is a big challenge for

orthodontist to maintain post treatment results.^{8,9}

Increase in intercanine width during orthodontic treatment has a strong tendency to return to its original position due to the imbalance in the muscular forces.^{3,4,10,11} Such changes in the arch dimension e.g. intercanine and intermolar widths warrant long term retention.^{3,6} Erdinc, Nanda, and Isıksal¹² found that lower inter canine width increases during orthodontic treatment. Kim E et al¹³ also confirmed that intercanine width of mandibular arch increases during orthodontic treatment. Gianelly⁸ reported that lower intercanine width was 0.94mm larger in the extraction group when compared to non-extraction sample.

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Canine occupies a wider part of the arch in extraction cases as it moves buccally while retraction.^{1,7} It would be of interest to orthodontist to identify whether the changes in intercanine width are similar or dissimilar in case of extraction and non-extraction. Existing literature has provided limited information about the changes in the mandibular inter canine width pre and mid orthodontic treatment in extraction and non-extraction cases. To our knowledge, there is no such study available in the local as well as international orthodontic literature.

The objective of the current study was to investigate and compare mandibular inter canine width in pre and mid orthodontic treatment in extraction and non-extraction orthodontic cases. This will help us in planning for stability of the arch dimensions during diagnosis, treatment planning, and retention phase of orthodontic treatment and will also help in the identification of the extent of increase in intercanine width during orthodontic treatment.

Material and Methods

This prospective study was approved by the ethical committee of the Rehman College of Dentistry Peshawar (EC Ref No.2021-06-074), and all participant signed written informed consent. The sample consisted of 61 consecutive orthodontic patients (29 extractions and 32 non extractions), who were being treated at the department of orthodontics, Rehman College of Dentistry Peshawar.

The duration of our study is 20 months, starting from 8 Apr 2019 to 3 Dec 2020. Sample size was not calculated, however the power of the study with calculated data is almost 81% with confidence level of 95% (OpenEPI power calculator). All patients were selected based on the following inclusion criteria; At the start of treatment patient must have a full set of permanent dentitions (excluding third molar). For extraction cases the patient must have undergone bilateral lower first premolar extraction for

comprehensive orthodontic treatment. Patients were excluded based on following criteria; Impacted canine, block out canines while treated non extraction, mandibular incisor extraction case, inter proximal stripping done during the leveling and alignment phase, craniofacial anomalies, patient who never received orthodontic or orthognathic surgery treatment.

Fixed orthodontic appliance of MBT prescription (0.022 × 0.028-in slot) was bonded to all patients, 0.014 NiTi arch wire were placed for leveling and alignment followed by 17× 25 NiTi and finally 19× 25 SS arch wire, all patient received ovoid arch form. Measurement was taken until passive engagement of a 0.019 × 0.025-in stainless steel arch wire.

The mandibular intercanine width was measured on plaster cast (pre-treatment and mid-treatment) using digital vernier caliper (Figure 1-2) (Guo genRmade in China) accurate to 0.01 mm. The mandibular intercanine width was measured from the cusp tip of the canine as describe by Bashara et al.⁴ In extraction group mid treatment was considered after the leveling and alignment of six anterior teeth. In non-extraction group at least 6 months was considered mid treatment. The principal investigator (Z.U.) recorded all



Figure 1

measurements. To assess intra-examiner reliability, from each group 10 patients were selected—and remeasure two weeks later by the same investigator. Also, to assess inter-

examiner reliability,10 subject was randomly selected from each group, and the main investigator (Z.U) was evaluated by another examiner.



Figure 2

Statistics

All statistical analysis were performed using the SPSS (Statistical package for social sciences) software version 20 (IBM, Armonk, NY). Independent sample t-test was performed to compare the changes in the intercanine width in both groups. A paired sample t-test was performed to observe the treatment changes within each group. P value of 0.05 or less was considered significant. For reliability, Pearson’s correlation coefficients were used. An r value of 0.85 or higher was considered excellent reliability.

Results

Our study had a sample of 61 patients (29 Extraction and 32 non extraction). 27 Patients were males (44.4%) and 34 females (55.7%). The mean age of the sample was (20.11± 4.6 years). Mean value of the intercanine width pretreatment and Mid treatment in non-extraction group was 26.5± 1.74 ,27.07± 1.76, respectively. The mean Inter canine width pre and Mid treatment in Extraction group was 26.7±2.32, 27.54 ± 2.36, respectively. When Comparison was made with in both extraction and non-extraction groups there was a significant change P<0.05 between pre-treatments and mid treatment intercanine widths. When pre-treatment intercanine widths were compared in both groups results were insignificant. Similarly, when

comparisons were made between mid-treatment intercanine widths results were insignificant.

TABLE I: Baseline Data

		N	Mean	Std. Deviation	Range
	Age	61	20.11	4.641	20
Extraction Group	ICW Pre-treatment	29	26.7379	2.32155	10.00
	ICW Mid-treatment	29	27.5448	2.36002	9.60
Non-Extraction Group	ICW Pre-treatment	32	26.5666	1.74009	9.20
	ICW Mid-treatment	32	27.078	1.76233	8.70

*ICW (intercanine width)

TABLE II: Pretreatment and mid-treatment mandibular Intercanine width in extraction and non-extraction cases.

	Ext. n=29	Non ext. n=32		
	Mean ±SD	Mean ±SD	Diff	P
ICW pretreatment	26.73±2.32	26.56±1.74	0.17	NS*
ICW mid-treatment	27.54±2.36	27.07±1.76	0.47	NS*

*NS indicates not significant; SD=standard deviation, ICW= Intercanine width

TABLE III: Comparison of pretreatment and mid-treatment mandibular intercanine width in non-extraction cases.

	Pre-treatment	Mid-treatment		
	means±SD	means±SD	Diff	P
ICW	26.56±1.74	27.07±1.76	0.51	.00*

*P<0.05, ICW= intercanine width

TABLE IV: Comparison of pretreatment and midtreatment mandibular intercanine width in extraction cases.

	Pre-treatment	Mid-treatment		
	means±SD	means±SD	Diff	P
ICW	26.73±2.32	27.54±2.36	0.81	000*

*P<0.05, ICW= Intercanie width

Discussion

Dental arch is in equilibrium between the tongue lingual and cheek buccally, disturbance of this equilibrium increases the chance of relapse and reduces the risk of stability.^{5,14} Arch dimensional changes occur during orthodontic treatment and that these dimensional changes occur from the start of treatment during the leveling and alignment phase.^{1,15,16} In extraction cases the canine move to the premolar extraction site which have more arch width, thus intercanine width increases.⁷

In our study mandibular intercanine width was measured in mid treatment with extraction and without extraction cases. In previous studies intercanine width were assess pre and post treatment, in our study we choose mid treatment to evaluate whether major changes are occurring in mid treatment or toward the end of treatment.

The data of our study show that increases mandibular inter canine during mid-treatment in extraction and non-extraction cases was statistically significant ($p < 0.05$) (Tab.3,4). A study conducted by Herzgo et al⁷ of 31 extraction and 31 non extraction sample showed that comparing both group (extraction, non-extraction) the intercanine widths (maxillary and mandibular) has no significant difference post treatment. Mandibular intercanine width in the extraction group showed a significant increase of 1.40 mm were found. The intercanine width in the nonextraction group increases significantly of 1.20 mm for the mandibular arch. in our study mandibular inter canine width increased by 0.81mm in the extraction group.

Weinberg and Sadowsky¹⁷ stated that statistically significant increase of mandibular intercanine width post-treatment of (0.9 mm) treated non-extraction. Similarly, in our study mandibular intercanine width have statistically significant increases of (0.51mm) in the non-extraction group.

Cotrin et al¹⁸ suggested that canine is moved distally to the premolar extraction space to

solve the initial crowding and canine occupy premolar space thus mandibular intercanine width increases. Our findings are with accordance to the result of the previous studies.

Mandibular intrcanine width decreases as patient mature due to the lip pressure at the corner of the mouth. Numerous reports show that transverse expansion at the canine region is never maintained. To maintained post-treatment canine position permanent retention is recommended.¹⁹

In our study measurement was taken in pre-treatment and mid-treatment this is the primary limitation, another limitation is small sample size, and all patients were same ethnic group. To overcome this limitation measurement should be taken throughout the treatment and select a large sample size of different ethnic group.

Conclusions

- Mandibular inter canine width increases in mid treatment in the extraction and without extraction group.
- There is no significant difference of inter canine width between the groups.

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