The Evaluation of Arch Width Changes in Orthodontic Treatment (Ext or non-Ext) in Patients Treated in Dental Faculty of Tehran University of Medical Science

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Abstract

Aim: To extract or not to extract?! This fundamental decision has spawned some intense debate in orthodontics. Crowding ,as a common problem in permanent dentition , is usually handled by extraction and non extraction treatment. It is well established that increase in dental arch length and width during orthodontic treatment tend to return toward pretreatment values after retention. An undocumented criticism of extraction treatment is that it results in narrower dental arches and therefore less attractive smile esthetics.

Purpose: The main purpose of this study was to examine the dental arch width changes of extraction and non extraction treatment in patients treated in dental faculty of Tehran University of medical science.

Materials and Methods: This study was performed on pretreatment and post treatment dental casts of 75 patients (36 extraction and 39 non extraction).

Arch widths were measured from the cusp tips of the canines and first molars, using a digital caliper.

Results: Multiple regression analysis was used to evaluate the treatment changes in the arch width dimensions. The results show that intercanine arch width in both arches at the end of treatment was not significantly changed neither in extraction nor non extraction treatment. However; intermolar arch width in both arches shows differences between two groups. It increased significantly in non extraction treatment,and decreased in extraction samples.

Conclusion: The results of this study indicate that intercanine arch width has no significant relationship with the type of treatment, but intermolar arch width shows statistically significant difference between two groups.We can conclude that constricted arch widths are not a usual outcome of extraction treatment, as there is no significant difference between post treatment intercanine arch width in two types of treatment (IJO 2006;1:187-93).

Key Words: Arch width changes ; Extraction and non extraction

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Transverse or vertical arch malrelationships such as crowding and local irregularities are common causes of Class I malocclusions and are handled usually by extraction or nonextraction treatment in the permanent dentition. Considerable controversy still surrounds the question of whether better long-term results are achieved by extraction or by nonextraction therapy.[1]

It is well established that increases in dental arch length and width during orthodontic treatment tend to return toward pretreatment values after retention.[2] Arch width appear to be a determinant of smile esthetics. An undocumented criticism of extraction treatment is that it results in narrower dental arches when compared with non-extraction therapy.[3] Non-

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extraction treatments have gained widespread popularity because of the condylar displacement, narrowed smiles accompanied by dark corners, dished-in profiles with extractions, and suboptimal mandibular growth.[4]
The maintenance of the pretreatment values for intercanine and intermolar 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.[5] Past studies revealed that the mandibular intercanine and intermolar width dimensions show a strong tendency to relapse and should be considered inviolate.[6] Although the literature has provided information regarding the effects of extraction and non-extraction therapy, the findings on the amount of interarch changes of Class I extraction and non-extraction therapy display variation. This may be attributed to the differing treatment modalities, malocclusion types, and sample sizes. Therefore, an attempt was made in this study to have a homogenous study group in terms of malocclusion type and treatment mechanics. The purpose of this study was to compare the dental arch width changes of Angle Class I malocclusion after both non-extraction and four first premolar extraction therapies in patients treated in dental faculty of Tehran University of Medical Science and to determine the changes in arch widths because of treatment.

MATERIALS AND METHODS

Pre- and post treatment records of 75 cases (39non ext and 36ext) were evaluated in this study.There were 55girls and 20 boys with a mean age of 15 years.
The patients who were treated by fixed edgewise appliances where selected on the basis of the following criteria:
1. All the patients had skeletal and dental class I malocclusion.
2. At the start of treatment, all patients were in the permanent dentition.
3. All the teeth were present and there is not any missing or gross dental or developmental anomaly.
4. There is no supernumerary or impacted teeth.
5. None of the patients had any adjunctive appliance or previous orthodontic treatment.
6. There is no interproximal caries.
7. All the soft tissues such as lips and tongues were in normal size and there are not hypo or hyper function.
8. All the records like primary and final casts and radiographies were present in the archive.
9. All the patients were treated in dental faculty of Tehran university of medical science.
The casts with any attrition, fracture or ectopic eruption of the teeth specially canines were excluded. Patients with any developmental defect like cleft palate, etc and also other malocclusions like Cl II and III cases were excluded.
The intercanine and intermolar widths of the maxillary and mandibular dental arches were measured using a digital caliper with the accuracy of 0.01mm.The measurements performed from the cusp tips of the canines and mesiobuccal cusp of the first molars. The collected data were computerized and processed using SPSS software(version 11).To evaluate the effects of variables such as age, gender, duration of treatment, the amount of space deficiency and type of treatment (Ext or Non-ext) on arch widths, we use multiple regression analysis.

RESULTS

At the start of treatment, the maxillary and the mandibular intercanine and intermolar widths of both groups did not differ statistically (Table 1and 2). The data of this study revealed that intercanine arch widths increased not significantly regardless of the treatment modalities. There is no significant difference between two groups (ext or non-ext) in both arches. The intermolar widths showed some differences. There is a significant increase of intermolar width in non-ext group of maxilla, and a significant decrease in intermolar width in extraction group of mandible. Also we try to determine the correlation coefficient of the arch width after the treatment with variables such as type of treatment, age, gender, duration of treatment and space deficiency. The data show that intercanine arch width in both arches has no statistically significant relationship ($p>0.05$) with any of the variables specially type of treatment (ext or non-ext) (Table 3and 4). However; the intermolar arch width shows significant relationship with type of treatment ($p<0.05$),but no relationship with other variables.(Table 5&6)

Table1. Pretreatment and posttreatment maxillary intercanine and intermolar arch widths: means and SD(mm)

	MAX.EXT	N	Mean	Std. Deviation	Std. Error Mean
MAXIC.B	.00	39	33.4609	2.23887	.37844
	1.00	36	34.0955	3.51955	.78700
MAXIC.A	.00	39	35.0839	1.74770	.29542
	1.00	36	35.8655	1.53950	.34424
MAX.IM.B	.00	39	50.0943	3.25547	.55027
	1.00	36	49.9335	2.52056	.56362
MAX.IM.A	.00	39	51.7326	2.76349	.46712
	1.00	36	48.4920	1.69055	.37802
MAXIC.D	.00	39	1.6231	2.04318	.34536
	1.00	36	1.7700	3.10830	.69504
MAXIM.D	.00	39	1.6383	2.10091	.35512
	1.00	36	-1.4415	1.75127	.39160

Table2. Pretreatment and posttreatment mandibular intercanine and intermolar arch widths: means and SD(mm)

	MAN.EXT	N	Mean	Std. Deviation	Std. Error Mean
MAND.ICB	.00	39	25.9483	1.77323	.29554
	1.00	36	25.9674	2.33217	.53504
MAND.ICA	.00	39	26.5944	1.44459	.24077
	1.00	36	26.9295	1.94825	.44696
MAN.IM.B	.00	39	44.3516	3.14893	.52482
	1.00	36	44.1832	2.64322	.60640
MAN.IM.A	.00	39	45.4781	2.80089	.46682
	1.00	36	41.7921	2.21068	.50716
MANDIC.D	.00	39	.6461	1.29485	.21581
	1.00	36	.9621	1.63945	.37612
MANIM.D	.00	39	1.1265	1.53652	.25609
	1.00	36	-2.3911	1.81327	.41599

Table3. Dependent Variable : MAXIC.D

Model		Sig.
1	(Constant)	.006
	GENDER	.144
	AGE	.132
	MAX.EXT	.528
	SP.MAX	.196
	TIME	.070

Table4. Dependent Variable: MANIC.D

Model		Sig.
1	(Constant)	.081
	GENDER	.810
	AGE	.127
	SP.MAX	.282
	TIME	.164
	MAN.EXT	.570

Table5. Dependent Variable: MAXIM.D

Model		Sig.
1	(Constant)	.067
	GENDER	.617
	AGE	.161
	MAX.EXT	.000
	SP.MAX	.120
	TIME	.582

Table6. Dependent Variable: MANIM.D

Model		Sig.
1	(Constant)	.438
	GENDER	.821
	AGE	.183
	SP.MAX	.068
	TIME	.691
	MAN.EXT	.000

DISCUSSION

It is well accepted that, during orthodontic treatment involving the extraction of teeth, arch dimensional changes occur and that these dimensions continue to change after active treatment.[7] Intercanine and intermolar widths tend to decrease during the post-retention period, especially when expanded during treatment. In this study, the arch width measurements in the extraction and non-extraction Class I patients were examined. The data of this study revealed that intercanine arch widths increased not significantly in two groups and there is no difference between two groups. In the extraction group, the decrease in mandibular intermolar was statistically significant ($P < .05$).In the non-extraction group, there was a statistically significant increase in the maxillary intermolar width. In line with modern orthodontic techniques, a specific treatment plan is designed for each patient, with treatment techniques chosen to meet the patient's specific needs. A narrow upper arch requires rapid maxillary expansion (RME), whereas an extremely protrusive profile necessitates the extraction of permanent teeth.[9] However when making a decision between non-extraction and extraction treatment in borderline cases it should be borne in mind that the selected treatment may affect not only the esthetics of the smile but the whole face, also long term stability of the treatment is very important.

Since the mean age for our study group was 15 years, the effects of growth and development were not of concern. The arch widths in this investigation were measured from the buccal cusp tips. Studies measuring the arch widths from the most buccal points on the teeth have disregarded the bucco-lingual inclinations of the related teeth.[1,3] If teeth are palatally inclined in a wide alveolar arch, measurements carried out on the most buccal aspects of the teeth present the dental arch as a wide one, whereas measurements carried out on the cusp tips reflect the arch as it is during smiling.[9,10] When the crown inclination is taken into consideration as the key factor for a full and radiant smile,[11] the location of the measurement registration is of importance. On the basis of the concepts documented in the literature, one might have expected to find narrower arches after extraction.[12] The results of this study confirm that extraction treatment does not result in narrower dental arches than non-extraction treatment. The maintenance of the pretreatment values for intercanine and intermolar distances (specially intercanine) was suggested as the key to posttreatment stability. In this study no statistically significant change in intercanine widths were observed. The results show that after extraction treatment, lower posterior teeth moved mesially into narrower parts of the arch, indicating that anchorage requirements were kept moderate. A review of the results of various studies reveals the same results in McCauley, Strang, Muge Aksu and Eunkoo Kim studies.[1,10] Weinberg and Sadowsky[13] in a retrospective study of Class I malocclusion–treated non-extraction, found significant increases in the mandibular intercanine and intermolar arch widths and stated that the resolution of the crowding in the non-extraction therapy of Class I malocclusion was achieved by expansion of the

buccal segments in mandibular arch. However, among the 30 patients participating in that study, 16 received some kind of palatal expander, which might cause expansion in the mandibular arch. The increase in the mandibular intercanine width in non-extraction patients can be explained by minimal expansion with the archwires. Bishara et al.[14] studied the long-term stability of extraction and non-extraction orthodontic treatment and found that during the treatment the maxillary intercanine width of the males increased significantly in the extraction group because of the alignment of the crowded anterior segment. However, they did not mention the initial tooth size arch length discrepancies of the study group. The maxillary and mandibular intermolar widths increased in the non-extraction group and decreased in the extraction group. The intercanine and intermolar width findings are similar to the findings of this study, although the malocclusion types was different between the two studies. Gianelly et al.[3] studied arch width after extraction and non extraction treatment. In this study malocclusions and reference points were different from ours. They obsereved an increase of mandibular intercanine width in extraction group.

Minimal change of intercanine arch width after orthodontic treatment was observed which documented that the treatment modalities which is done in our university were successful.

CONCLUSION

1)There is no difference between the effects of extraction, non-extraction treatment modalities on the distance between the canines in both arches.

2)The treatment modalities which is done in our university were successful because of minimal change in arch widths specially intercanines.

3)Intermolar width shows differences between two groups.

4)Extraction treatment does not result in narrower dental arches than nonextraction treatment.

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