

Change in Arch Width After Extraction and Non Extraction Treatment

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Abstract

Objective: The aim of this study was to compare the arch width dimension after extraction and non extraction in pre and post orthodontic treatment.

Methods: Comparative cross sectional study was carried out in the Orthodontics Department of Alvi Dental Hospital, Karachi, from June to December 2010. Non probability, purposive type of sampling technique was used for data collection. Our sample consists of sixty patients, of which the extraction group was n= 30 (50%) and non extraction group n=30 (50%). Pre treatment and post treatment intercanine (Anterior) and intermolar (Posterior) arch widths of maxillary and mandibular arch was calculated on cast and compared statistically.

Results: In extraction group maxillary intercanine width was 0.70 mm and mandibular intercanine arch width was 0.18 mm larger than non extraction group. In extraction group maxillary intermolar width was 1.65 mm and mandibular intermolar width was 1.3 mm smaller than non extraction group.

Conclusion: Extraction treatment did not result in narrower dental arches as compared to non extraction treatment.

Keywords: Dental extraction, Dental non extraction.

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Introduction

The fundamental decision to extract or not to extract has resulted in an intense debate in orthodontics^{1,2,3} and for long has been a key question in planning orthodontic treatment. In orthodontics there are two major reasons to extract the teeth: (1) to provide space to align the remaining teeth in the presence of severe crowding, and (2) to allow teeth to be moved so that skeletal Class II or Class III can be camouflaged¹. The alternate to ex-

traction in treating dental crowding is to expand the arches; the alternate for skeletal problem is to correct the jaw relationship by modifying growth or surgery. All other things being equal, it is better not to extract but in some cases extraction provides the best treatment. Opinions for the extraction have changed remarkably from one extreme to another and back.

One issue is the effect of extraction on the buccal corridor, a recently introduced landmark that represents the space between the buccal surface of the dentition and the corresponding soft tissues with particular emphasis on the corners of the mouth^{4,5,6}. The advocates of non extraction treatment presumes that, the appearance of unaesthetic black triangles at the corners of the mouth during smiling, dark shadows lateral to the buccal segments and dishing in of face are expected outcomes of four first-premolar extraction treatment because this therapy with the retraction of anterior

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segment, cause narrowing of the width of the dental arches and shrinks the arches, resulting in a dentition that is too small to fill the mouth during a smile^{7,8}.

On the other hand advocates of extraction therapy presumes that non extraction therapy causes excessive lip strain and lip incompetence with failure of long term instability of finished results⁹.

Sometimes if the patient profile is fuller as in bimaxillary protrusion cases, one can consider extraction so that the lip, chin and nose can be brought in harmony^{9,10,11}. In some patients if the facial profile is dished in or flatter but nose and chin are in good balance relative to lips we have to consider the case non extraction so that we can bring the lips in good relation with other facial components.

The decision of extraction and non extraction treatment with other available tools in orthodontics should be considered after thorough assessment of complete orthodontic records and treatment decision should be tailor made according to need of each individual case keeping in mind the long term effects of ageing on the facial profile.

Because a point of contention by those who support the buccal-corridor relationship is a narrowing of the dental arches, the purpose of this study was to compare anterior and posterior widths of the dental arches after extraction and non extraction therapy to determine whether extraction treatment results in narrower dental arches which also indirectly effects on buccal corridor relationship.

An orthodontist must use every tool at his disposal to give his patient a treatment result that is healthy, functional and stable. This study is being undertaken to statistically evaluate the anterior, posterior arch widths of two groups of 30 patients each treated by either four first-premolar extraction³ or nonextraction in both pre and post stages of treatment. The study will help determine and compare the results of extraction and non extraction on arch

width dimension in a selected group of patients from a tertiary care hospital in Karachi.

Patients and Methods

Comparative cross sectional study was carried out in the Orthodontics Department of Alvi Dental Hospital, Karachi, from June to December 2010. Informed consent was taken from the patient. Non probability, purposive type of sampling technique was used for data collection. Our sample consists of sixty patients, half of them (n=30) belonged to extraction group (group A) and half of them (n=30) belonged to non extraction group (group B). All patients received fixed appliance therapy .

Inclusion criteria were dental Class I, II & III, adult patient (Age 11 years above), both sexes, fully erupted incisors, canines, premolars and first molars. Patients with congenitally missing tooth/teeth, those who were treated with expansion appliance and syndromic patients (e.g., Crouzon syndrome, Apert Syndrome, etc.) were excluded from the study.

Dental casts are considered good diagnostic tool in orthodontic practice. The dental cast facilitates the analysis of tooth size and shape; alignment and rotations of the teeth; presence or absence of teeth; arch width, length, form and symmetry; and the occlusal relationship.

Arch width⁹ was measured by selecting the most labial surfaces of canines and first molars. These points were identified on dental cast by using a 0.5 mm lead pencil and measured by using Vernier caliper. Each distance was measured three times and the average of the three values was used as the final measure. Arch width is ordinarily established by the mandibular arch, pre treatment widths between the mandibular canines and molars were recorded to establish that the arch widths of the mandibles of both samples were similar at the start of treatment. The treatment changes in the mandibular intercanine and intermolar dimensions were also determined. The pretreatment maxillary intercanine and intermolar dimensions were not

measured because they vary in different malocclusions, and the distribution of malocclusions was not the same in each group.

For data analysis software SPSS version 11.0 was used and descriptive statistics were analyzed with mean age \pm SD. Arch width was assessed by using t test and level of significance was 0.05 ($p = 0.05$).

Results

Our sample consists of 60 patients, half of them ($n=30$) belonged to extraction group (group A) and half to non extraction group (group B). In extraction group (group A) 11 (36.7%) patients were male and 19 (63.3%) patients were female and in non extraction group (group B) 6 (20%) patients were male and 24 (80%) patients were female. In extraction group the mean age of the patients was 18.1 ± 3.33 years and in non extraction group the mean age of patients was 16.3 ± 3.33 years. Mean age of the whole group (group A and group B) was 17.21 ± 3.72 years.

At the start of treatment, intercanine and intermolar widths of both groups did not differ statistically as shown in Table 1. At the end of treatment, the intercanine and intermolar arch widths of both groups were found statistically insignificant ($p=0.05$). In extraction group maxillary intercanine width was 0.70 mm and mandibular intercanine arch width was 0.18 mm larger than non extraction group as shown in Table 2.

In extraction group maxillary intermolar width was 1.65 mm and mandibular intermolar width was 1.31 mm smaller than nonextraction group as shown in Table 2.

Discussion

Extraction and nonextraction treatment are considered as a vital tool in Orthodontics. Orthodontist is usually the first professional to make decision regarding the way a patient will look for the rest of life; therefore it's important to make a decision after weighing what will happen to the face af-

ter adolescence, in adulthood and older age¹². Corrected anterior teeth in the adolescent may appear over retracted 20 years later. Then if the patient is concerned cosmetically, only facial soft tissue sur-

Table 1. Comparison of pre treatment mandibular intercanine and intermolar arch width

Variables	Mean \pm SD(mm) (n=30)	Mean difference	p-value
3-3 L Start			
Extraction	31.43 \pm 3.24		
Non extraction	28.50 \pm 3.82	-0.21	0.81
6-6 L Start			
Extraction	50.10 \pm 3.91		
Non extraction	45.75 \pm 4.05	0.31	0.75

3, canine; 6, first molar; U, maxillary; L, mandibular.
 $p < 0.05$ considered statistically significant

Table 2. Comparison of post treatment maxillary and mandibular arch intercanine and intermolar width

Variables	Mean \pm SD(mm) (n=30)	Mean difference	p-value
3-3 U			
Extraction	38.92 \pm 3.77		
Non extraction	38.22 \pm 3.74	0.70	0.47
3-3 L			
Extraction	31.78 \pm 2.99		
Non Extraction	31.60 \pm 3.20	0.18	0.82
6-6 U			
Extraction	53.47 \pm 3.37		
Non Extraction	55.12 \pm 3.86	-1.65	0.08
6-6 L			
Extraction	49.00 \pm 3.60		
Nonextraction	50.32 \pm 3.81	-1.31	0.17

3, canine; 6, first molar; U, maxillary; L, mandibular
 $p < 0.05$ considered statistically significant

gery, orthognathic surgery, or both can improve the effects of orthodontic treatment. The high extraction rates and profile flattening of the 1950s and 1960s resulted in many unaesthetic facial outcomes with which all Orthodontists and Dentists are familiar^{13,14}. The demand for adult orthodontic treatment also increases the need to understand the facial aging process. A thorough knowledge of all available treatment options provides a more successful treatment outcome and results in greater patient satisfaction. Change in anterior, posterior arch widths after extraction and nonextraction treatment were studied in this study.

Gianelly AA¹⁵ did similar study in which anterior and posterior arch widths of the maxillary and mandibular arches of 25 patients treated by four first-premolar extraction and 25 patients treated without extractions were measured on post treatment study models and compare statistically to determine the effects of extraction and non extraction. Measurements were made in the canine and the molar region from the most labial aspect of the buccal surfaces of the canines and molars. In both groups, anterior and posterior arch widths were the same except for the mandibular intercanine dimension, which was 0.94 mm larger ($P=0.01$) in the extraction group concluding that extraction treatment does not result in narrower dental arches than nonextraction treatment. This study also concludes that extraction treatment did not result in narrower dental arches.

BeGole et al¹⁶ also observed that the mandibular intercanine widths increased 1.58 mm in an extraction sample and 0.95 mm in nonextraction sample. Udhe et al¹⁷ illustrated treatment changes in the graph form in extraction and nonextraction groups and demonstrated that the pretreatment intercanine widths were comparable in both groups, and during treatment, a larger increase occurred in the extraction sample. Our study findings were also in agreement with study conducted by Johnson and Smith¹⁸ that posterior part of the arch becomes narrower as the molars move mesially in the narrower part of the arch during space closure.

Luppanapornlarp and Johnston¹⁹ evaluated the posttreatment and long-term results of treatment in extraction and nonextraction patients and noted that the mandibular intercanine dimension of the extraction subjects was greater at all stages examined than the same parameters in their nonextraction patients. This data also suggest that there is no systemic narrowing of the dental arches as a result of 4 first-premolar extraction treatment.

In extraction patients change in posttreatment intercanine mean width is significant (p value $<.05$), maxillary post treatment intercanine mean width was 0.73 mm larger and mandibular intercanine mean width was 0.57 mm larger than pre treatment intercanine width. These findings were in agreement with earlier studies done by Gianelly AA et al.¹⁵ in which maxillary intercanine mean width increased 0.83 mm and mandibular intercanine mean width increased 0.94 mm.

Paquette DE et al.¹ had also done similar study in which he found that increase of the mandibular intercanine width in those treated with extraction therapy was 1.0 mm and increase in non extraction sample was 0.5 mm. The findings of this study also demonstrate statistically insignificant differences in post treatment intercanine and intermolar arch widths. Change in post treatment mean maxillary intercanine arch width was 0.2 mm and change in mean mandibular intercanine arch width was 0.66 mm.

This study and the available data indicate that the width of dental arches, at least in the canine region, is generally not smaller after extraction therapy than after nonextraction therapy.

Conclusion

The findings of this study indicates that extraction treatment does not result in narrow dental arches as compared to nonextraction treatment, therefore there are no esthetically displeasing side effects of extraction treatment on smile esthetics. Extraction and nonextraction treatment can be suc-

cessfully used after accurate diagnosis, treatment plan and treatment mechanics.

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