

Comparison of Buccal Corridor Width in Extraction and Non-Extraction Mithilanchal Orthodontic Patients

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ABSTRACT

Introduction: A wide variety of opinion exists on the effect of extraction on the buccal corridor width which has a direct impact on smile esthetics. Till date no study regarding this has been done in Mithilanchal population.

Aims and objectives: To compare the post-treatment buccal corridor width and posterior corridor width of patients treated with or without four first premolars extraction in Mithilanchal population.

Materials and Methods: This was a cross-sectional study conducted at department of orthodontics and dentofacial orthopedics in Mithila Minority Dental College and Hospital, Darbhanga, Bihar. Post treatment posed smile photographs of 24 extraction patients and 24 non-extraction patients were compared using standardization and cropping in adobe photoshop version 7.0. Statistical analysis was done with SPSS software (IBM Corp 2013; Version 22.0; Armonk, NY) and independent t-test to compare buccal corridor width and posterior corridor width between two groups.

Results: The age group of subjects varied from 13 to 26 years. The mean age of group 1 (extraction) and group 2 (non-extraction) patients were 17.75 ± 4.48 years and 20.21 ± 4.03 years respectively. The mean width of buccal corridor in extraction patients were 35.33 ± 1.52 % and for non-extraction group was found to be 35.38 ± 1.54 %. (non-significant, $p = 0.903$). The posterior corridor mean width was 20.46 % in group 1 patients and 19.83% in group 2 patients (non-significant, $p = 0.274$).

Conclusion: No significant difference in the buccal corridor and posterior corridor widths was found after orthodontic treatment with and without extraction of the first four premolars.

KEYWORDS: buccal corridor; posterior corridor; extraction ; non - extraction; smile analysis

INTRODUCTION

Smile is an important aspect of facial aesthetics. Frush and Fisher defined buccal corridor as the area between the labial surface of the posterior-most tooth and the labial commissure when smiling.^{1,2} The width of the buccal corridor is a crucial component of a balanced smile. The position of the maxilla, the tonicity and mobility of the lips, the movement and contraction of muscles, particularly the elevator group of facial muscles, the buccolingual inclination (torque) of the posterior teeth, and the shape of the arch can all have an impact on the buccal corridor.³⁻⁵ According to Naini et al⁶, in an "attractive" smile the oral commissures distance should increase by 30% of normal intercommissural width during smiling. The total space between the facial

midline and commissure of one side should have 60 percent of the teeth surface and 40 percent of buccal corridor space.⁶

The typical buccal corridor width in a patient with a pleasing smile is 1.5 to 2.5 mm on each side. Instead of using the labial surface of the posterior tooth as a reference, some authors employed the distal surface of the canine⁷. Patients with prognathic maxilla has less buccal corridor width and wider arch and the reverse applies for retrognathic maxilla.^{8,9}

Spahl said that the removal of a tooth in each quadrant results in a reduction in the radius of curvature of the dental arch.^{10,11} However, Johnson argued that the dental arch is not a circle that contracts when a tooth

is removed. Since part of the molar is visible during a full smile the presence or absence of premolars does not affect the buccal corridor width. Also, cases treated with arch expansion did not show statistically significant difference of buccal corridor width when compared with extraction cases.¹² Kim et al. stated that neither extraction nor non-extraction treatment has a significant impact on the aesthetics of a smile.¹³

To compare the post-treatment buccal corridor width and posterior corridor width of patients treated with or without four first premolars extraction in Mithilanchal population.

MATERIALS AND METHODS

This was a cross-sectional study consisting of 48 samples with 24 in each group. The sample was obtained from the departmental archive of completed cases available in the department of orthodontics and dentofacial orthopedics in Mithila Minority Dental College and Hospital, Darbhanga, Bihar.

In the photographs, the areas involving the smile of the patient, upper and lower lips, and nasolabial folds were focused on for the study. The photographs were standardized using the ruler tool from Adobe Photoshop version 7.0. The measurement to be reproduced on the horizontal and vertical rulers of the software was 7.42 x 4 cm (Fig. 1 and 2).

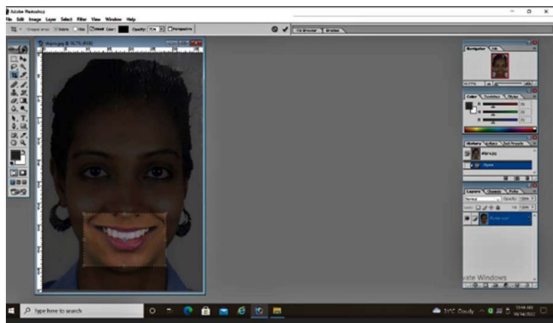


Fig. 1. Frontal smiling photograph manipulated in Adobe Photoshop application

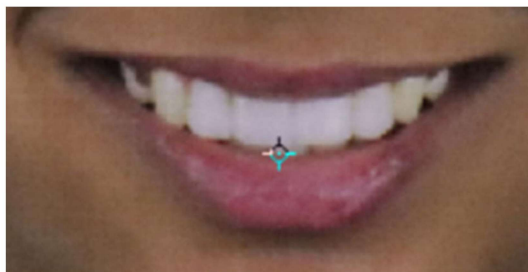


Fig 2. Final cropping of smile area after standardization and eliminating other orofacial structures

Six vertical lines were drawn to mark the upper intercanine distance (UID), distance between the last visible teeth of the maxilla (DLVTM) and smile width (SW) as shown below (Fig. 5).

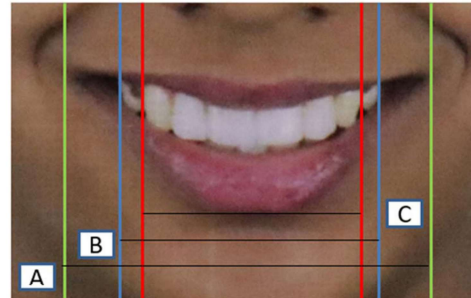


Fig 5. Vertical lines showing (A) smile width (SW), (B) distance between the last visible teeth in maxilla (DLVTM) and (C) upper intercanine distance (UID)

These attributes were measured in millimeters. The following formulae were used to calculate the buccal corridor (BC) and posterior corridor (PC) in percentages.¹⁴ Buccal corridor width percentage is equal to the difference between smile width (SW) and upper intercanine distance (UID) upon smile width (SW) multiplied by 100; posterior corridor width is equal to difference between smile width (SW) and distance between last visible teeth in maxilla (DLVTM) upon smile width (SW) multiplied by 100. Statistical analysis was performed using SPSS software (IBM Corp 2013; Version 22.0; Armonk, NY).

RESULTS

In group 1 treated with extraction protocol, 10 were males and 14 were females. In group 2 (non-extraction) group 8 were males and 16 were female subjects. The age group of subjects varied from 13 to 26 years. The mean age of group 1 and group 2 samples were 17.75 ± 4.48 years and 20.21 ± 4.03 years respectively (Table 1). The mean difference in age between two groups was found to be non-significant after testing with the independent t-test.

Table 1:

Mean age comparison between Group 1 and Group 2.

Groups	N	Min	Max	Mean age	SD of age	Mean difference	P value
Group 1	24	13.00	26.00	17.75	4.48	2.46	0.052 NS
Group 2	24	13.00	26.00	20.21	4.03		

The gender distribution was calculated with chi-square test and no significant difference was found between two groups (Table 2).

Table 2: Gender distribution

Gender	Group 1		Group 2		P value
	n (%)	n (%)	n (%)	n (%)	
Male	10 (41.7%)	8 (33.3%)	8 (33.3%)	10 (41.7%)	0.551 NS
Female	14 (58.3%)	16 (66.7%)	16 (66.7%)	14 (58.3%)	

Independent t-test was done to compare the percentage of the BC (buccal corridor) width and PC (posterior corridor) width between group 1 and group 2 and no statistical significance was noted between the two groups (Table 3).

Table 3: Comparison of BC (buccal corridor) width and PC (posterior corridor) width between two groups

	Group 1 (n = 24)		Group 2 (n = 24)		Mean difference	P value
	Mean (%)	SD	Mean (%)	SD		
Buccal corridor	35.33	1.52	35.38	1.54	0.05	0.903 NS
Posterior corridor	20.46	1.79	19.83	2.16	0.63	0.274 NS

*NS= Not significant

DISCUSSION

The age group of subjects varied from 13 to 26 years. Since most patients seeking fixed orthodontic treatment and extraction is also performed mostly in this age group, this age group has been selected for study. The mean age of group 1 samples (post-treatment photographs treated with extraction protocol) was 17.75 ± 4.48 years. The mean age of group 2 samples were 20.21 ± 4.03 years (post-treatment photographs of patients treated with non-extraction protocol).

The mean difference of age between the two groups was found to be non-significant after testing with independent t-test. Both the males and females were included in the study.

In this study, the average buccal corridor width was 35.33 percent in group 1 and 35.38 percent in group 2, with a p-value of 0.93 which is in agreement with the study of Branco and Janson et al where no statistically significant difference between individuals treated with symmetric (extraction of all four first premolars) and

asymmetric extraction on the buccal and posterior corridor widths (only one first premolar) was found. Also, the canine-to-commissural distance (SW-UID) in our study was less making the smile width to UID difference bigger. This difference may be due to factors like greater commissural elevation during smile, method of retraction, tip and torque of canines, arch form, and arch width.

Woods and Meyers in 2014 conducted an elaborate study regarding buccal corridor width changes in extraction and non-extraction patients. There was no significant difference in any buccal corridor widths or areas measured between the extraction and non-extraction subjects.¹⁶

However, according to Spahl et al,¹¹ the removal of a tooth in each quadrant results in a reduction on the radius of curvature of the dental arch, contracting the arch and leading to a dentition that is not enough to fill the buccal cavity during smile and results in increased buccal corridor width. This is in contrast with the result of our study.

The authors feel this non-significant result of buccal and posterior corridor widths between two groups may be due to reasons such as the intercommissural width, which was within the same range, the upper /lower anterior teeth proclination in both groups were same, retraction in the extraction group could be done by moderate anchorage control and growth pattern of both groups were within normal range.

This study has a few limitations. The age group was confined to 13 to 26 years so the results may not be generalized to children and older adults. Longitudinal studies measuring changes in the commissure, lips, and smile aesthetics along with the growth of lips and facial muscles will be more informative.

CONCLUSION

No significant difference in the buccal corridor and posterior corridor widths was found after orthodontic treatment with and without extraction of the first four premolars suggesting that extraction of premolars may not have any impact on corridor spaces which may cause worsening of the smile.

CONFLICT OF INTEREST: None

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