

# Oral hygiene status of orthodontic patients using hyrax expander

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## Abstract

**Introduction:** Oral hygiene maintenance is paramount alongside Orthodontic treatment. In Pakistan, oral hygiene awareness is inadequate and measures must be taken to improve it for decreasing the load on tertiary care facilities. Hence the aim of the present study was to determine oral hygiene status of orthodontic patients requiring hyrax expander as part of their treatment reporting to Orthodontics Department, Khyber College of Dentistry, Peshawar.

**Material and Methods:** The study was conducted on 30 patients (14 males and 16 females) of age ranging between 8 and 14 years. Simplified oral hygiene index (OHI-s) by Green and Vermilion<sup>11</sup> was used to calculate plaque values before insertion of hyrax, after one month of insertion and after three months of insertion of hyrax expander. Six index teeth were selected that included four posterior teeth and two anterior teeth. Buccal surface of maxillary first permanent molars, maxillary right central incisor, mandibular left central incisor and lingual surface of mandibular first permanent molars was examined for the presence of plaque. Data were analyzed using SPSS version 20.0.

**Results:** Sample included 30 patients (11.9±1.37 years). Mean score of OHI-s increased as treatment progressed with eventual adverse effects on periodontal health. The changes in the mean OHI-s score between the study months changed statistically significantly ( $p < 0.05$ ) that showed significant change in the oral hygiene of patients after one month of hyrax insertion. Difference between male and female OHI-S score was insignificant with  $P > 0.05$ .

**Conclusions:** Oral hygiene of patients undergoing orthodontic treatment with hyrax expander deteriorates with time and measures must be taken to take this effect in account when planning this kind of treatment.

**Keywords:** Plaque; rapid palatal expansion

## Introduction

Oral hygiene maintenance is very important for successful orthodontic treatment. Orthodontic appliances facilitate accumulation of plaque and make it difficult to clean teeth. This causes oral health problems like periodontal disease, caries, halitosis, staining of teeth and calculus formation.<sup>1</sup> Orthodontic appliances used for

orthodontic treatment stay in mouth from 18 to 30 months and plaque accumulation in the subgingival bands and brackets can lead to gingival hypertrophy, bleeding and other periodontal problems.<sup>2,3</sup> The orthodontic appliances change the oral environment and increase the concentration of acid-producing bacteria which is a common cause of hyperplastic gingivitis.<sup>4</sup> Therefore patients undergoing active orthodontic treatment must follow a rigid oral hygiene protocol to prevent such lesions.<sup>5</sup>

Rapid maxillary expansion is an effective orthopedic procedure used to correct a constricted maxilla, transverse deficiencies and posterior crossbite in growing patients. Rapid maxillary expansion can be tissue borne (Haas type expansion) or tooth borne

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(Hyrax type expansion).<sup>6,7</sup> Hyrax is preferred by most orthodontists as it is more hygienic than Haas.<sup>8-10</sup> The purpose of this study was to assess the impact of wearing a hyrax expander on oral hygiene. The detrimental effect of poor oral hygiene on periodontal tissues is well known to Orthodontics. Expansion with hyrax carries a risk of gingival recession as a result of moving teeth outside the envelope of alveolar bone. Any positive association found between hyrax wear and poor oral hygiene would mean that the orthodontist should be extra vigilant and should reinforce oral hygiene maintenance with extra vigor. Hence the objective of this study was to determine association between oral hygiene status of orthodontic patients wearing hyrax expanders

## Material and Methods

The study was conducted on 30 patients (14 males and 16 females) of age ranging between 8 and 14 years. The sample was selected from Orthodontic Department, Khyber College of Dentistry, Peshawar. The patients and their parents were informed about the purpose and procedure of the study and consent was sought. Healthy patients without any systemic disease, having permanent dentition with the exception of second and third molars requiring rapid maxillary expansion were included in the study.

Simplified oral hygiene index (OHI-s) by Green and Vermilion<sup>11</sup> was used to calculate plaque values before insertion of hyrax, after one month of insertion and after three months of insertion of the expander. Six index teeth were selected that included four posterior teeth and two anterior teeth. Buccal surface of maxillary first permanent molars, maxillary right central incisor, mandibular left central incisor and lingual surface of mandibular first permanent molars was examined for the presence of plaque. Presence of orthodontic bands on the teeth disturbs evaluation of plaque values as described in OHI-s index, therefore plaque values were determined in

dichotomies (positive presence of plaque on tooth surface was marked as 1 and negative as 0). OHI-s index was calculated as total score divided by number 6. The mean, standard deviation and range were computed using SPSS version 20. Paired t-test was used for comparison.

## Results

The mean age of 30 patients was  $11.9 \pm 1.37$  years with a range from 8 to 14 years. The mean age of males was  $12.07 \pm 1.38$  years with a range from 10 to 14 years and that of females was  $11.75 \pm 1.39$  with a range from 8 to 13 years. The gender distribution showed that 14 (46.6%) were males and 16 (53.3%) were female patients. Mean OHI-s score at baseline, at one month and third month during hyrax treatment with standard deviations and range were calculated (Table 1). The results showed that OHI-s index scores increased with time potentially meaning that periodontal health worsened as the treatment progressed. This could have severe adverse effects on periodontal health. Mean value of OHI-s at baseline was 2.0, at one month interval was 3.2 and at third month was 3.6 (Table I). All the patients were given standardized oral hygiene instructions and were reinforced on each visit.

The oral hygiene status was evaluated on monthly basis (Table II). The changes in the mean OHI-s score of the first month to baseline was statistically significant at  $p < 0.05$  which showed significant increase in simplified oral hygiene index score after one month of hyrax insertion. Month wise comparison was made for OHI-s at baseline and third month for all the groups (Table III). The changes in the mean OHI-s score of the third month to baseline was significant at  $p < 0.05$  which showed significant increase in simplified oral hygiene index score after third month of hyrax insertion. Table IV shows the mean and standard deviation for male and female groups. The mean for male group is 2.8 and the mean for female group is 3.1. The

difference between male and female OHI-S score was found to be insignificant with P value > 0.05 (Table V). These results show that oral hygiene of patients undergoing orthodontic treatment with hyrax expander deteriorates and plaque retention increases as the treatment continues with time.

**Table I: Descriptive statistics of OHI-s score**

statistics	t <sub>0</sub>	t <sub>1</sub>	t <sub>3</sub> *
Mean	2.00	3.26	3.63
N	30	30	30
Std. Deviation	1.231	1.25	1.245
Range	4.00	6.00	5.00
Minimum	.00	.00	1.00
Maximum	4.00	6.00	6.00

\*t<sub>0</sub>, baseline; t<sub>1</sub>, after one month; t<sub>3</sub>, after three months

**Table II : Comparison of OHI-s score before and after one month**

		Paired Differences				t	df	Sig. (2-tailed)*
		Mean	SD	Std. Error Mean	95% CI Lower Upper			
Pa	t1 - t0	1.26	1.17	.21	.82 1.7	5.91	29	.00

\*Paired Samples Test

**Table III: Comparison of OHI-s score before and after three month**

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	SD	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower				Upper
t3 - t0		1.63	.99	.18	1.26 2.0	8.95	29	.000	

**Table IV: Gender Wise OHI-score**

Gender	N	Mean	Std. Deviation	Std. Error Mean
Male	14	2.8095	1.21046	.32351
Female	16	3.1042	.98672	.24668

**Table V: Gender wise comparison of OHI-s using Independent Sample t Test**

Levene's Test for Equality of Variances	t-test for Equality of Means								
	F	Sig.	t*	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI	
								Lower	Upper
1.03	.31	-.73	28	.46	-.29	.40	-1.11	.52	

\*Independent Sample t Test

## Discussion

Poor oral hygiene during orthodontic treatment can be due to lack of knowledge or lack of interest of the patient. Many a times, patients are not given proper instructions, or they are unable to follow the given instructions. Patients must be motivated to understand the instructions properly and maintain oral health. Patient's knowledge about the gingival health should also be assessed.<sup>12</sup>

The treatment with fixed appliances is increasing nowadays. Sometimes orthodontic treatments are carried out to improve oral hygiene and reduce plaque retention when tooth movements may relieve crowding. On the other hand, orthodontic treatment can also increase the plaque retention and thus can have an adverse effect on oral hygiene. Hyrax is banded to the maxillary first molars and first premolars which may hinder oral hygiene.<sup>13</sup> For these patients preventive measures are necessary and orthodontists promote proper oral hygiene in their patients. Increase of motivation among orthodontic patients regarding sustainable oral hygiene regime might result in better oral health outcomes and prevent complications. Because of the increasing number of patients in need of orthodontic appliances, this is important and useful not only for Orthodontists, but General Dentists or Periodontists as well.<sup>14</sup>

Literature also confirms that there is increase of plaque accumulation during orthodontic treatment and places further emphasis on the fact that patients must have good oral hygiene maintenance throughout treatment.<sup>15-17</sup> It has also been suggested that accumulation of plaque is greater in patients undertaking orthodontic treatment with fixed appliances when compared with removable appliances but evidence to support this statement was weak.<sup>18</sup>

The present study proved that hyrax treatment increased the risk of having poor oral hygiene status. This finding is in agreement with the available literature.<sup>19</sup> It was concluded that oral hygiene of children who used orthodontic appliances was effected than those who never used orthodontic appliances. Plaque index and gingival index was assessed in another experimental study,<sup>20</sup> 3 months after orthodontic treatment was commenced. Similar results were found. Contrary to the results of the present study, Ajayi et al revealed a satisfactory oral hygiene status among orthodontic patients, where oral hygiene status of 43 orthodontic patients was assessed. 27 patients exhibited good oral hygiene, 16 had fair oral hygiene while none had poor oral hygiene.<sup>21</sup> These results contradict the results of the study and this might be due to difference in education level, assessment method or follow up methodology.

## Conclusions

Besides the benefits of Orthodontic treatment with hyrax expander like crossbite correction, reducing overcrowding and improving breathing, there are some risks associated with it and effect on oral hygiene is one of them. Orthodontists should reinforce oral hygiene measures in patients undergoing treatment with hyrax. Hopefully better outcomes can be achieved through patient awareness and education in this respect.

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