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ORIGINAL ARTICLE

The effect of orthodontic banding on gingival health of first permanent molars.

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ABSTRACT… Objective: To determine the effect of orthodontic banding on gingival health of first permanent molars. **Study Design:** Quasi Experimental. **Setting:** Khyber College of Dentistry, Peshawar. **Period:** 15th December 2020 to 15th June 2021. **Material & Methods:** This study was conducted on 70 patients by non-probability consecutive sampling technique. Both genders, adult (age 18-40 years) needing orthodontic fixed treatment and having all first permanent molars were included. Patients with medications and medical conditions affecting gingival health and history of periodontal disease were excluded. The gingival health was assessed using gingival and plaque indices before and six months after banding of molars. Paired t test was used for comparing the gingival and plaque indices before and six months of treatment. **Results:** The mean age was 27±10.12 years. The males were 29(41.42%) and female were 41(58.58%). The mean gingival index score was 1.09±1.10 before banding and was 1.87±1.63 after six months and was statistically significant (p=0.001). Similarly the change in plaque index was very highly statistically significant (p<0.001). Both gingival (p=0.02) and plaque (p=0.04) indices were statistically significantly aggravated in those not brushing their teeth. Similarly the patients who are not using any sort of interdental aids had significantly increased plaque (p=0.01) and gingival (p=0.03) indices. **Conclusion:** Orthodontic banding can adversely affect the gingival health in patients receiving fixed appliance treatment. Lack of proper oral hygiene maintenance further aggravates poor gingival health.

Key Words: Gingival Index, Gingival Health, Molar Bands, Plaque Index.

INTRODUCTION

The orthodontic treatment is aimed to correct the irregularities and malrelationship of dental and surrounding hard tissues.[1] Attachments in orthodontics can be bonded called brackets or tubes or banded called bands. Orthodontic appliances are creating a network on dentition which can aggravate the stagnation of foods.[2] The brackets and molar tube are occupying less surface area over the crowns of dentition as compared bands.[3]

Bands on molars are indicated due to large forces they receive during fixed appliances like headgear or lip bumper; large restoration in molars; and need of lingual attachments like transpalatal arch and lingual arch.[4]

Molar bands are occupying more surface area and penetrate deep in gingival sulcus leading to more detrimental impact on gingival health.[5] Due to plaque accumulation gingival inflammation and hyperplasia can be seen in orthodontic patients. In case of negligence in maintaining good oral health the molar bands results in gingivitis and periodontitis.[6] Gingivitis is reversible condition with no loss of attachment while periodontitis is an irreversible condition with clinical attachment loss. [7] Most of the orthodontic patients are in growing age in which gingivitis usually does not lead to periodontitis. [8]

Huser et al.[9] reported plaque index and bleeding tendency of patients wearing molar bands at 0 and 3 months of treatment increased significantly with band placement. Plaque index score 2 or 3 was present at 75% sites having molar bands.

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Boyd et al.[10] reported that plaque index score for bands was 0.4±0.51 for adults and 1.33±0.89 for adolescents before treatment and 0.4±0.32 for adults and 1.34±0.71 for adolescents during treatment. The gingival index score for bands was 0.29±0.73 for adults and 1.06±0.83 for adolescents before treatment and 1.06±0.75 for adults and 1.79±0.45 for adolescents during treatment.

To the best of my knowledge there is paucity in the local data about this subject. This is first of its kind of study comparing the gingival health before and after placement of orthodontic bands in patients reporting to Khyber College of Dentistry, Peshawar. This will provide helpful information for applications in clinical practice using simple tools. The study will provide a guide to orthodontists for identification and prevention of damage caused to gingival tissues by orthodontic band.

The objective of this study was to assess the effect of orthodontic banding on gingival health in patients receiving fixed orthodontics treatment.

MATERIAL & METHODS

This quasi experimental study was conducted at Orthodontic department, Khyber College of Dentistry, Peshawar from 15th December 2020 to 15th June 2021 on 70 participants by using non-probability, consecutive sampling technique. The sample size was calculated by using Open Epi taking gingival index to be 0.29±0.73 before treatment and 1.06±0.75 during treatment at 95% CI and 90% power of the test but in order to assume the normality assumption of data we had taken a total of 70 patients. Both genders, adult (age 18-40 years) need orthodontic fixed treatment and having all first permanent molars were included. Patients on medications (like Calcium channel blockers, phenytoin, carbamazepine, and steroids) and medical conditions (like diabetes mellitus and blood dyscrasias) affecting gingival health and history of periodontal disease were excluded.

Study was conducted after approval of institutional ethics review committee (AD/PG/R/KCD). Patients were explained and a written consent was taken from the willing patients. All the participants were given instructions about oral hygiene measure during fixed orthodontic treatment. The gingival and plaque index were recorded before and after six of orthodontic treatment around the all first permanent molar teeth using WHO probe under light illumination. The gingival index score was recorded as 0(no inflammation in gingival tissues); 1 (mild change in color, slight edema but no bleed to probing); 2(moderate gingivitis: erythema, edema with bleed to probing) and 3(severe gingivitis: severe erythema, ulceration, hyperplasia and spontaneous bleeding. The plaque index score was recorded as 0(no plaque); 1(plaque attach to free gingiva and adjacent cervical dental region); 2(moderate plaque in gingival sulcus and on the gingival margin seen by naked eye); and 3(severe plaque within the gingival pocket and/or on the tooth and gingival margins). These indices scores were recorded on each surface of molars and on each first molar and averaged for surfaces and teeth to calculate mean value for each participants before and six months after treatment.

Data were analyzed in SPSS 22. Continuous data were computed as mean and SD while frequencies and percentages for categorical data. Paired t test was used to compared gingival and plaque indices six months after and before of band placement. The analyses were stratified by gender, age groups, educational level, oral hygiene measure, brushing frequency and inter dental aids to see effect modification using paired t test. The statistical significance was $p \leq 0.5$.

RESULTS

The mean age was 27±10.12 years. The males were 29(41.42%) and female were 41(58.58%). Most common age group was 18-30 years (n=62, 8.57%). The most common educational level was secondary (n=16, 22.85%) followed by graduate (n=21, 30). Most of the participants were not doing brush (n=36, 51.42%) and 31(44.28%) were brushed their teeth and 3(4.30%) were using miswak. Most common pattern of brushing was once a day (n=27, 38.58%) and 7(10%) brushed

their teeth twice a day. Most commonly used interdental aids was floss (n=11, 15.70) and few cases used tooth pick (n=3, 4.30%). (Table-I)

The mean gingival index score was 1.09±1.10 before banding and was 1.87±1.63 after six months and this increase in gingival index score was statistically significant(p=0.001). Similarly the change in plaque index was very highly statistically significant (p<0.001). (Table-II)

The results for both gingival and plaque indices were statistically significant in age group 18-30 years but non-significant in age groups 31-40 years. In females the gingival and plaque indices score increased statistically (p=0.04). (Table-III)

Both gingival (p=0.02) and plaque (p=0.04) indices were statistically significantly aggravated in those patients not brushing their teeth. Similarly the patients who are not using any sort of interdental aids had significantly increased plaque (p=0.01) and gingival (p=0.03) indices. (Table-IV).

DISCUSSION

This study was aimed to assess the effect of orthodontic banding on gingival health in patients receiving fixed orthodontics treatment. Our findings found detrimental effect of banding on gingival health. Both gingival and plaque indices increases significantly after six months of molar bands placed in patient's mouth.

Variable	Characteristics	N (%)
Gender	Male	29(41.42)
	Female	41(58.58)
Age group (years)	18-30 years	62(88.57)
	31-40 years	8(11.43)
Educational level	Primary Level	16(22.85)
	Secondary Level	33(47.15)
	Graduate level	21(30)
Oral hygiene measure	No Brushing	36(51.42)
	Tooth Brushing	31(44.28)
	Miswak	3(4.30)
Brushing frequency	Once a day	27(38.58)
	Twice a day	7(10)
	Nil	36(51.42)
Inter dental aids	Tooth pick	3(4.30)
	Floss	11(15.70)
	None	56(80)

Table-I. Demographics and oral hygiene status of the participants

Variable	Before (n=70)	After (n=70)	P-Value*
Gingival Index	1.09± 1.10	1.87± 1.63	0.001
Plaque index	1.02± 1.21	1.91± 1.75	<0.001

Table-II. Change in gingival and plaque indices with orthodontic banding
***Paired t test**

Variable	Characteristics	Parameter	Before	After	P-Value
Age group	18-30 years	Gingival Index	1.12± 1.27	1.91± 1.84	0.006
		Plaque index	1.15± 1.21	1.89± 1.69	0.0059
	31-40 years	Gingival Index	1.15± 1.22	1.83± 1.86	0.4
		Plaque index	1.19± 1.30	1.97± 1.95	0.36
Gender	Male	Gingival Index	1.16± 1.15	1.88± 1.81	0.07
		Plaque index	1.19± 1.21	1.83± 1.66	0.09
	Female	Gingival Index	1.15± 1.21	1.76± 1.54	0.04
		Plaque index	1.13± 1.23	1.79± 1.61	0.04
Educational level	Primary	Gingival Index	1.10± 1.13	1.74± 1.93	0.26
		Plaque index	1.13± 1.19	1.87± 1.84	0.18
	Secondary	Gingival Index	1.14± 1.08	1.81± 1.73	0.06
		Plaque index	1.16± 1.11	1.87± 1.71	0.049
	Graduate	Gingival Index	1.17± 1.13	1.91± 1.77	0.11
		Plaque index	1.19± 1.23	1.88± 1.80	0.15

Table-III. Change in gingival and plaque indices with orthodontic banding stratified by age, gender and educational level
***Paired t test**

Variable	Characteristics		Before	After	P-Value
Oral hygiene measure	No Brushing	Gingival Index	1.17± 1.23	1.92± 1.73	0.02
		Plaque index	1.22± 1.28	1.97± 1.85	0.04
	Tooth Brushing	Gingival Index	1.09± 1.12	1.56± 1.44	0.15
		Plaque index	1.10± 1.20	1.61± 1.53	0.14
	Miswak	Gingival Index	1.08± 1.18	1.47± 1.49	0.74
		Plaque index	1.09± 1.21	1.51± 1.66	0.74
Frequency of brushing	Once a day	Gingival Index	1.11± 1.21	1.68± 1.77	0.17
		Plaque index	1.14± 1.18	1.71± 1.81	0.17
	Twice a day	Gingival Index	1.10± 1.14	1.74± 1.73	0.42
		Plaque index	1.17± 1.19	1.89± 1.84	0.40
	Nil	Gingival Index	1.22± 1.15	1.93± 1.72	0.02
		Plaque index	1.25± 1.19	1.96± 1.78	0.04
Interdental aids	Tooth pick	Gingival Index	1.20± 1.17	1.68± 1.67	0.70
		Plaque index	1.16± 1.15	1.73± 1.71	0.65
	Floss	Gingival Index	1.13± 1.22	1.87± 1.79	0.27
		Plaque index	1.12± 1.25	1.71±1.96	0.40
	None	Gingival Index	1.23± 1.17	1.85 ± 1.81	0.03
		Plaque index	1.21± 1.22	1.91± 1.76	0.01

Table-IV. Change in gingival and plaque indices with orthodontic banding stratified by oral hygiene measure, brushing frequency and interdental aids
***Paired t test**

Many reasons can be responsible for detrimental gingival health in patients having molars; may be due to mechanical irritation of gingiva, or chemical irritation of glass ionomer cement used for retention of bands and food stagnation.[11,12]

A longitudinal study by Boyd et al. assessed the effect of molar tubes and molar bands on periodontal health prior to initiation of treatment, during treatment and post treatment. They reported that both gingival and plaque indices score increased statistically with treatment.[10]

Al-Anezi et al.[11] conducted a split mouth randomized clinical trial on 24 patients comparing the effect of molar tubes and bands on gingival health on three months follow up. They reported that gingival health detrimentally affected with band placement.

Another study comparing bonding attachments with molar bands on 50 orthodontic patients reported that gingival and plaque indices score significantly increased during and at the end of treatment as compared to baseline statistically.[13]

Our results found that only in those patients the bands adversely affect gingival health statistically who do not brush their teeth or do not use interdental aids. This shows that use of proper oral hygiene can overcome the adverse outcome associated with molar bands on periodontal health.

LIMITATIONS

The limitations this study are lack of subgingival plaque assessment and no use of sophisticated tools like electron microscope.[14]

CONCLUSION

Orthodontic banding can adversely affect the gingival health in patients receiving fixed appliance treatment. Lack of proper oral hygiene maintenance further aggravates gingival health.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

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1	Mashal Amir	Overall contribution of research and analysis.	
2	Ayesha Iqbal	Introduction, Writing.	
3	Farooq Maqsood	Discussion, Writing.	
4	Ujala Saif	Revision and corresponding author, Data collection and analysis.	
5	Mahnoor Parvez	Abstract writing.	
6	Tariq Ali Khan	Critical review of the manuscript, Expert research opinion.	