Association Between use of Interdental Cleansing Aids Gingival Conditions in Fixed Dental Prosthesis Patients

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ABSTRACT

Background

The fixed dental prosthesis are one of the most commonly used prosthesis which are difficult for cleansing in dental clinical practice especially the interproximal areas. As a result, periodontal disease most commonly develops in interproximal areas. The efficacy of using dental floss and interdental brushing in addition to tooth brushing reduce plaque and gingival inflammation.

Objective

To assess gingival condition in patients after placement of fixed dental prosthesis for a period of 3 months who regularly use or do not use dental floss and interdental brushing.

Method

Patients visiting the Dental Outpatient Department of Dhulikhel Hospital were selected for study. The examination was conducted using basic diagnostic tools (Mouth mirror, periodontal probe and explorer). The total number of patients involved in the study were 200. Teeth and gingiva were examined using the Plaque (Silness and Loe) and Gingiva Index (Löe and Silness). The examinations were conducted after 15 days and 3 months of placement of fixed dental prosthesis along with the oral hygiene instructions. Chi-square test and McNemar Bowker test were done to find statistical association using SPSS 20.0.

Result

Statistical analysis showed that there was association between frequency of interdental cleaning and plaque index (p=0.012) and gingival index (p=0.036) examined in 15 days and 3 months.

Conclusion

Use of Interdental cleansing aids was statistically significant to oral hygiene outcomes i.e. plaque index and gingival index. Oral hygiene instructions play a vital role in improving overall oral health.

KEY WORDS

Fixed partial denture, Gingival index, Oral hygiene, Plaque index

INTRODUCTION

In dental prosthesis the removal of plaque is important which is the primary etiological factor in the development of chronic inflammatory periodontal disease.[1-3] Regular and complete biofilm removal therefore helps in reducing the severity of periodontal diseases.[4] Although the toothbrush is successful in removing plaque at buccal, lingual and occlusal surfaces, it cannot completely clean the interdental surfaces.[5-8] It also seemed possible that as tooth brushing did not remove plaque between teeth and interdental cleaning did which would reduce the incidence of periodontal disease.[9-11] Studies showed that supragingival proximal surface of the patient who used interdental cleaning devices were free of plaque and similarly some subgingival deposits were removed up to a depth of 2–2½ mm below the gingival margin.[11-13] In wide interdental spaces, interdental brushes were the most effective devices for cleaning.[14]

Practice of good oral hygiene is important not only for protecting the remaining teeth, but for ensuring the durability of prosthodontic restoration and preserving the abutment teeth for future restoration. The objective of this study was to evaluate gingival condition in patients who regularly used or did not use interdental devices after placement of fixed dental prosthesis.

METHODS

A table comprising of variables of oral hygiene was developed to acquire required data from the subjects and the patients were examined and the observation data were filled personally. Patients visiting the Dental Outpatient Department (DOPD) of Dhulikhel Hospital, Kathmandu University, who were medically healthy were selected for the study. Total number of patients involved in the study was 200 and the duration of study was 3 months (June 2018 to September 2018). Sample size was calculated to be 200, using formula, $n=Z^2p(1-p)/d^2$, Where Z=static constant corresponding to level of confidence, p=expected prevalence and d=precision or margin of error, based on the average annual turn out of patients in Prosthodontic department of Dhulikhel hospital and considering prevalence of 50% with 5% margin of error, at 95% confidence interval and Z=1.96. Convenience sampling method was used for selection of patients. This study was conducted after receiving ethical approval from the Institutional Review Committee (IRC number 88/18).

The examination was conducted using basic diagnostic tools like mouth mirror, periodontal probe, and explorer. During examination, the entire sulcus of the abutment tooth was probed, and readings were taken at six points. Plague index and gingival index were calculated 15 days and 3 months after the placement of prosthesis on abutment teeth.

Dependent variables Plaque and Gingival index were recorded as given below:

Plaque Index (PI):

Plaque identification were done using an Erythosine disclosing solution based on Silness and Loe, four surfaces of the teeth (buccal, lingual, mesial and distal) is given a score from 0 to 3.[15] The scores from the four areas of the tooth are added and divided by six in order to give the plaque index for the tooth with the following scores and criteria.[15,16]

0- no plaque;

1- A film of plaque adhering to the free gingival margin and adjacent area of the tooth .The plaque may be insitu only after the application of disclosing solution or by using the probe on the tooth surface;

2- Moderate accumulation of soft deposit within gingival pocket or the tooth and gingival margin which can be seen with the naked eye;

3- Abundance of soft matter within the gingival pocket and or on the tooth and gingival margin.

Based on this the score are given as:

Excellent 0, Good 0.1-0.9, Fair 1.0-1.9, Poor 2.0-3.

Gingival index (GI):

Tooth will be examined for gingival inflammation signs and recorded based on Loe and Silness.[15,16] The score will be given as follows:

0- healthy;

1- subinflammatory, no bleeding on probing;

2- moderate inflammation, red and swollen, bleeding on probing;

3- obviously swollen or ulcer, spontaneity bleed.

Average score of four surfaces of the teeth (buccal, lingual, mesial and distal) of specific tooth are taken and are divided by four.

Based on this score is given.[16]

2.1-3.0 = severe inflammation;

1.1-2.0 = moderate inflammation;

0.1-1.0 = mild inflammation;

<0.1 = no inflammation.

Every time the patient came for check-up or follow-up, they were instructed about the good oral hygiene practices with demonstrations.

Independent variable

Patients were asked whether they regularly use interdental cleaning devices, with possible answers of none or use of interdental cleaning device.

Patients who used interdental cleaning device were classified into the following three groups:

1. Clean interproximally daily

2. Regularly but less than daily

3. Irregularly

Covariates

socio-demographic variables: age group (35–54, 55–74, ≥ 75 years), gender.[17-19]

Inclusion criteria were: Adult who were systemically healthy, non-pregnant, non-smokers were enrolled in this study. Patients were excluded from the study if there were evidence of generalized periodontal problems, medical history which may affect the periodontal status such as Diabetes, Hepatitis, HIV, habit of eating pan, supari, patients on drugs which cause hyperplasia of gums such as Calcium channel blocker, Cyclosporine A, Phenotoin and transplant patients because their immunity may be impaired, patient of age group below 18, overhang, unsuitable contour, lack of restoration margin , presence of gingival tissue swelling or suppuration with difficulty to apply cleaning devices fit.

Age, gender, and use of interdental cleaning were assessed through a prepared questionnaire for all the subjects, interviewed and questions were filled personally. Oral hygiene instructions were given and examination done after 15 days and 3 months. Chi-square test was done to find out the association between frequency of interdental cleaning and plaque index and gingival index. McNemar Bowker test was conducted to find out the statistical significance between examination periods of 15 days and 3 months and indicators of oral health (plaque index and gingival index). The level of significance was set at p-value < 0.05.

RESULTS

The mean age of the patient was 52.97 ± years ranging from 34 to 73 years (Table 1). Of the total patients, 93 were male and 107 were female. Most of the patients were illiterate (64), 53 had completed primary education, 43 secondary education and 40 had gone to high school (Table 1).

Interdental cleaning and oral hygiene outcomes at 15 days

Out of 200 patients on whom the fixed dental prosthesis were placed, 170 (85%) were performing interdental cleaning. Among the patients who performed interdental cleaning, two-third of the patients (114 in number) (67%) were performing interdental cleaning “daily”, 52 did it “ regularly but occasionally” whereas only 4 did it “irregularly” (Table 2). There was a significant association of interdental cleaning frequency with the indicators of oral hygiene outcomes (i.e. plaque index and the gingival index) with (p value 0.004 and 0.021 respectively, Table 2). Daily interdental cleaning was associated with a lower plaque index (i.e. excellent plaque status) and less gingivitis at 15 days. (Table 2).

Table 1. Distribution of different socio-demographic variables in the study population (n =200)

Variables	Number (Frequency)	Percentage (%)
Age		
20-40 years	35	17.5
41-60 years	108	54.0
61 and above	57	28.5
Gender		
Male	93	46.5
Female	107	53.5
Education		
Illiterate	64	32.0
Primary education	53	26.5
Secondary education	43	21.5
High school education	40	20.0

Table 2. Bivariate relationships between interdental cleaning and indicators of oral hygiene (PI and GI) at 15 days

Variables	Interdental cleaning			P-value (Chi-square test)
	Daily (n=114) N (%)	Regularly but less than daily (n = 52) N (%)	Irregularly (n= 4) N (%)	
Plaque index				
Excellent	101(88.6)	0 (0.0)	0 (0.0)	0.004
Good	13 (11.4)	14 (26.9)	0 (0.0)	
Fair	0 (0.0)	35 (67.3)	2 (50.0)	
Poor	0 (0.0)	3 (5.8)	2(50.0)	
Gingival index				
Healthy(no inflammation)	107 (93.9)	0 (0.0)	0 (0.0)	0.021
Mild gingivitis	7 (6.1)	48 (92.3)	4 (100.0)	
Moderate gingivitis	0 (0.0)	4 (7.7)	0 (0.0)	
Severe gingivitis	0 (0.0)	0 (0.0)	0 (0.0)	

Interdental cleaning and oral hygiene outcomes at 3 months

The number of patients who were using interdental cleaning devices at 3 months reached to 181 after oral hygiene instructions was given. There were no patients with “irregular” interdental cleaning practice. Those who performed “daily” interdental cleaning had significantly better plaque and gingival index compared to those who did it “regularly but less than daily”(p=0.01 and 0.17 respectively (Table 3).

Based on observations made on the interdental cleaning practice by the patients at 15 days and doing follow-up on them at 3 months, they were divided into 3 groups.

Table 3. Bivariate relationships between interdental cleaning and indicators of oral hygiene (PI and GI) at 3 months

Variables	Interdental cleaning		P-value (Chi-square test)
	Daily(n =169) N (%)	Regularly but less than daily (n=12) N (%)	
Plaque index			
Excellent	127 (75.1)	0 (0.0)	0.01
Good	40 (23.7)	14 (26.9)	
Fair	2 (1.2)	35 (67.3)	
Poor	0.0	3 (5.8)	
Gingival index			
Healthy (no inflammation)	156 (92.3)	0 (0.0)	
Mild gingivitis	13 (7.7)	12 (100.0)	0.017
Moderate gingivitis	0 (0.0)	0 (0.0)	
Severe gingivitis	0 (0.0)	0 (0.0)	

Group 1: Patients who were using interdental cleaning at both 15 days and at 3 months (n=169)

Group 2: Patients who were not using interdental cleaning at 15 days but were using it at 3 months (n=12)

Group 3: Patients who were not using interdental cleaning at both 15 days and at 3 months (n=14)

Group 1: (n =169)

Both plaque and gingival index significantly improved upon continuation of interdental cleaning in this group (p=0.012 and 0.036 respectively, Table 4). The proportion of patients with excellent plaque index rose from 101 at 15 days to 127 at 3 months and there were no patients with poor plaque index at 3 months. Similarly, there was a significant fall in the proportion of patients with mild gingivitis at 3 months (a fall of 46 patients) (Table 4).

Group 2: (n=12)

Both plaque index and gingival index improved significantly after the patients started interdental cleaning once the oral hygiene instructions were given to them (p=0.028 and 0.001 respectively, Table 5). When examined at 15 days the plaque index was mostly poor (11 patients) which improved significantly to good (5 patients) and fair (7 patients) after examination at 3 months follow-up. Similarly, the gingival index for moderate gingivitis (10 patients) and severe gingivitis (2 patients) at examination in 15 days showed drastic improvement to mild gingivitis (12 patients) in this control group at 3 months follow-up (Table 5).

Table 4. Comparision of Plaque and Gingival Index at 15 days and 3 months for group 1(n=169)

Variables	At 15 days N (%)	At 3 months N (%)	P-value (McNemar-Bowker test)
Plaque index			
Excellent	101 (59.8)	127 (75.1)	0.012
Good	27 (16.0)	36 (21.3)	
Fair	36 (21.3)	6 (3.6)	
Poor	5 (3.0)	0 (0.0)	
Gingival index			
Healthy (no inflammation)	107 (63.3)	156 (92.3)	
Mild gingivitis	59 (34.9)	13 (7.7)	0.036
Moderate gingivitis	3 (1.8)	0 (0.0)	
Severe gingivitis	0 (0.0)	0 (0.0)	

Table 5. Comparision of Plaque and Gingival Index at 15 days and 3 months for group 2 (n=12)

Variables	At 15 days N (%)	At 3 months N (%)	P-value (McNemar-Bowker test)
Plaque index			
Good	0 (0.0)	5 (41.7)	
Fair	1 (8.3)	7 (58.3)	0.028
Poor	11 (91.7)	0 (0.0)	
Gingival index			
Mild gingivitis	0 (0.0)	12 (100.0)	
Moderate gingivitis	10 (83.3)	0 (0.0)	0.001
Severe gingivitis	2 (16.7)	0 (0.0)	

Group 3: (n =14)

The comparison of Plaque index for patients, who did not use interdental cleaning, at 15 days and 3 months follow-up did not show any significant difference (p= 0.647, Table 6). Similarly, the comparison of gingival index for patients, who did not use interdental cleaning, at 15 days and 3 months follow-up also did not show any significant difference (p=0.85, Table 6). As expected, the plaque index of all the 14 patients in this group was poor at 15 days and same was the result at 3 months follow-up. The gingival index also followed the similar pattern of gingivitis (Table 6).

Table 6. Comparision of Plaque and Gingival Index at 15 days and 3 months for group 3 (n=14)

Variables	At 15 days N (%)	At 3 months N (%)	P-value (McNemar-Bowker test)
Plaque index			
Poor	14 (100.0)	14 (100.0)	0.647
Gingival index			
Moderate gingivitis	2 (14.3)	0 (0.0)	0.85
Severe gingivitis	12 (85.7)	14 (100.0)	

DISCUSSION

There are many studies on this topic indicating that dental prosthesis favour plaque accumulation and have a negative impact on gingival condition due to insufficient aftercare.[20]

In this study, the number of patients using interdental cleaning devices daily at 15 days increased significantly from 114 to 169 in three months follow up. This may be attributed to the instructions given to the patients about oral hygiene during their first visit, thus improving their awareness level regarding oral hygiene, despite high level of illiteracy (32%) among study population. The number of patients who use the interdental cleaning regularly but not daily at 15 days decreased significantly from 52 to 12 at three months follow up (Table 2 and 3). This decrease is due to the heightened level of awareness about oral health. Due to same reason, the patient who used interdental cleaning devices irregularly decreased from 4 to none compared from 15 days to three months examintation (Table 2 and 3). So many other studies highlight the importance of oral hygiene instructions.[21] As per a study by Firdus et al. it can be concluded that a single oral hygiene instruction has a small positive effect that will last 6 months or more.[21]

There was a significant association of interdental cleaning frequency (daily, regularly but less than daily and irregularly) with the indicators of oral hygiene outcomes (i.e. plaque index and the gingival index) both at 15 days and three months examination. Our result is supported by various other studies. A study by Crocombe et al. pointed out that the regular self interdental cleaning was associated with lower levels of dental plaque, dental calculus and gingivitis.[22] These indicators respond relatively rapidly to change in oral hygiene behaviours.[22] Another study concluded that tooth brushing or tooth brushing and adjunctive interdental cleaning devices such as dental floss, interdental brushes can significantly reduce both plaque and gingival inflammation. Use of interdental brushes reduces more inter dental plaque in comparison with toothbrush alone.[23]

In our study the population was divided into three groups. Group 1 consists of patients who carried out interdental cleaning at both 15 days and at 3 months. The statistical analysis showed that both plaque and gingival index significantly improved upon continuation of interdental cleaning in this group. The regular and continued use of interdental cleaning devices throughout the study period would definitely improve the plaque and gingival index. This is supported by a study conducted by Florence et al. concludes that interdental cleaning, similarly to tooth brushing, should become established part of daily oral hygiene for the reduction of interproximal plaque, the control of gingivitis.[24] However there are studies which report contradictory findings to our study. A study by Graziani et al. showed that comprehensive oral hygiene instruction of regular tooth brushing may significantly reduce plaque accumulation.[23] The adjunctive use of interdental devices, irrespective of the type involved, did not add any significant benefit over a 28 day period, in terms of reduction of overall plaque and gingival inflammation.[23]

Group 2 consists of patients who were not using interdental cleaning at 15 days but were using it at 3 months. The fact that the patients who were not using interdental cleaning devices at 15 days examination started using it at three months follow up may be attributed to oral hygiene instructions. Both plaque index and gingival index improved significantly after the patients started interdental cleaning at three months follow up. This could be contributed to the reexamination and reinstruction scheme. Reinstruction is detected as an important factor, since patients in other investigations show lower plaque scores after reinstruction.[25] It is concluded that professional advice and instruction and reinstruction seems very important in order to obtain good plaque control.[25]

Group 3 consists of patients who were not using interdental cleaning at both 15 days and at 3 months. Obviously, the patients plaque index was poor at both 15 days and three months examinations. The gingival index showed similar pattern in which the severe gingivitis increased to 14 at three months follow up from 12 at 15 days examination. This could be due to lack of motivation to follow oral hygiene instructions though same instructions were given to all the participants. People with higher oral hygiene-related self efficacy might be more affected by oral hygiene instructions than patients with a low oral hygiene self efficacy.[26]

Due to time constraint, only 200 patients could be included in the study. Therefore, it is recommended that the future studies should include more number of sample and must be carried out for a longer duration. While providing information it may be that some patients report regular interdental cleaning because they do not want to inform the interviewer of their own shortcomings and thus avoiding embarrassment. This can bring wrong results.

CONCLUSION

Interdental cleaning is statistically significant to oral hygiene outcomes, i.e. plaque index and gingival index. The instructions given on the importance of use of interdental cleaning and how to use it properly and effectively prove to be very helpful in maintaining the oral hygiene. Therefore, provision should be made so that the dental practitioners impart proper oral hygiene instructions to all the patients.

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