

Abutments and periodontal parameters in prospective denture wearers

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Abstract

Introduction: Dentures are common tooth replacement option and they may pose an increased periodontal risk to abutment teeth resulting in premature tooth loss.

Aims and Objectives: To determine if a difference exists between periodontal parameters of abutment teeth, and non-abutment teeth on the same of the edentulous area in prospective denture wearers.

Materials and methods: Consecutive partially edentulous patients demanding for removable partial denture were selected. Interviewer-administered questionnaires were used and examination done with dental instruments - mouth mirrors, dental explorers and periodontal probes. Selected non-abutment teeth were adjacent to the abutment teeth on the same arch.

Plaque assessment and periodontal pocket depths were done on the four surfaces (buccal, lingual, mesial and distal) of all abutment and non-abutment teeth excluding third molars. Probing depth estimated to the nearest minimum was recorded for the selected teeth, and data collected was analyzed with IBM SPSS 20. Student t tests and ANOVA were utilized.

Results: Sixty-one participants with mean age of 60.9 ± 14.27 years, and age range from 21 to 71 years were seen. Thirty-six (59%) were male. Majority (96.8%) brushed with toothbrush only, 51.5% brushed once a day and 57.4% had Kennedy class III edentulous arches. Mean probing depth of abutment (2.40 ± 0.16 mm) and non-abutment teeth (2.24 ± 0.15 mm) varied significantly ($p < 0.001$). Majority of those who brushed once daily and those who had Kennedy Class III edentulous spaces had poor Oral Hygiene ($p < 0.0001$, $p = 0.03$ respectively). Differences in the probing depth of abutment ($F = 0.46$), non-abutment teeth ($F = 1.11$) and oral hygiene ($F = 1.13$, $p = 0.71$, $p = 0.35$, $p = 0.34$ respectively).

Conclusion: Abutment teeth of edentulous spaces had poorer periodontal status than non-abutment teeth, suggesting increased risk for periodontal disease for prospective abutment teeth. Greater attention should therefore be given to these abutment teeth during oral hygiene measures in denture wearers. Location of edentulous space on dental arch have significant relationship with oral hygiene status.

Keywords: Abutment, Non-abutment, Periodontal, Prospective and Status

Résumé

Contexte: Les prothèses dentaires sont une option courante de remplacement des dents et elles peuvent présenter un risque parodontal accru pour les dents piliers, entraînant une perte prématurée des dents.

Buts et objectifs : Déterminer s'il existe une différence entre les paramètres parodontaux des dents piliers et les dents non piliers sur la même zone édentée chez les futurs porteurs de prothèses dentaires.

Matériels et méthodes : Des patients consécutifs partiellement édentés nécessitant une prothèse partielle amovible ont été sélectionnés. Des questionnaires administrés par des intervieweurs ont été utilisés et des examens effectués avec des instruments dentaires - miroirs buccaux, explorateurs dentaires et sondes parodontales. Les dents non piliers sélectionnées étaient adjacentes aux dents piliers sur la même arcade.

L'évaluation de la plaque et les profondeurs des poches parodontales ont été effectuées sur les quatre surfaces (buccale, linguale, mésiale et distale) de toutes les dents piliers et non piliers, à l'exception des troisièmes molaires. La profondeur de sondage estimée au minimum le plus proche a été enregistrée pour les dents sélectionnées, et les données recueillies ont été analysées avec IBM SPSS 20. Des tests t de Student et une ANOVA ont été utilisés.

Résultats : Soixante et un participants avec un âge moyen de $60,9 \pm 14,27$ ans et une tranche d'âge de 21 à 71 ans ont été vus. Trente-six (59 %) étaient des hommes. La majorité (96,8%) s'est brossée avec une

brosse à dents uniquement, 51,5% s'est brossée une fois par jour et 57,4% avaient des arcs édentés Kennedy de classe III. La profondeur de sondage moyenne des dents piliers ($2,40 \pm 0,16$ mm) et non piliers ($2,24 \pm 0,15$ mm) variait significativement ($p < 0,001$). La majorité de ceux qui se sont brossés une fois par jour et ceux qui avaient des espaces édentés de classe Kennedy III avaient une mauvaise hygiène bucco-dentaire ($p < 0,0001$, $p = 0,03$ respectivement). Différences dans la profondeur de sondage du pilier ($F = 0,46$), des dents sans pilier ($F = 1,11$) et de l'hygiène bucco-dentaire ($F = 1,13$, $p = 0,71$, $p = 0,35$, $p = 0,34$ respectivement).

Conclusion : Les dents piliers des espaces édentés avaient un statut parodontal moins bon que les dents non piliers, ce qui suggère un risque accru de maladie parodontale pour les dents piliers potentielles. Une plus grande attention doit donc être accordée à ces dents piliers lors des mesures d'hygiène bucco-dentaire chez les porteurs de prothèses. La localisation de l'espace édenté sur l'arcade dentaire a une relation significative avec l'état d'hygiène bucco-dentaire.

Mots-clés : *Pilier, non-pilier, parodontal, prospectif et statut*

Introduction

Tooth loss has been said to have impact on an individual's aesthetics, functional, social and psychological well-being [1,2].

Dental caries and periodontal disease are major causes of tooth loss.[3] To prevent these diseases, it is important that oral care be instituted which aims at improving and maintaining oral hygiene [3].

It is common to see patients seeking dental treatment to replace the loss of a considerable number of teeth [4], sometimes no replacement option is instituted as in the case of shortened dental arch or these teeth are replaced with either removable or fixed prosthesis [5]. Removable prosthesis has been found to be the most utilized option of replacement because of its affordability. Removable partial dentures are made of metal, acrylic resin and flexible/ valplast materials. Removable partial dentures can increase the occurrence of caries, impair the periodontium and escalate the extent of stress on natural teeth [6-8]. It has also been noted that removable acrylic resin partial dentures adversely affect periodontal parameters when teeth are in contact with resin denture base [9].

Removable partial dentures may thus increase the risk for tooth loss. People who have existing biofilm

induced periodontal disease and are highly susceptible to caries are obviously at greater risk for further tooth loss since acrylic partial dentures may aggravate these conditions [10]. In a previous study [11]. it was noted that removable acrylic resin partial dentures were reported to have an adverse effect on periodontal parameters when the abutment teeth were in contact with resin base and this effect was found to increase with longer duration of removable partial denture (RPD) wear. A study done using periostest showed no significant changes in tooth mobility during the 6-months follow-up [12]. There has been insufficient evidence on the impact of prosthodontic intervention on the impact of abutment teeth and further tooth loss [13].

The aim of this study was to determine the periodontal status of abutment and non-abutment teeth without prosthodontics intervention.

Methods

This was a descriptive, cross sectional study that was carried out at the periodontology and prosthetic outpatient clinics of the Lagos University Teaching Hospital, Surulere in Lagos State of Nigeria.

Consecutive partially edentulous patients demanding for either acrylic or valplast removable partial denture and willing to participate were selected. Participants, with systemic diseases such as diabetes mellitus, on current medications that might modify the gingival tissues such as antihypertensives (e.g calcium channel blockers), with generalized advanced chronic periodontitis and current smokers were excluded. Interviewer- administered closed – ended WHO questionnaire [14] was modified and adopted to collect data. Information gathered from this questionnaire were sociodemographic, tooth status which was used to classify location of edentulous area using Kennedy Classification) [15] and Oral hygiene habits (frequency of brushing). Dental instruments such as mouth mirrors, dental probes and periodontal probes were used in oral examination.

Kennedy classified partial edentulism into four basic groups

Class I: Bilateral edentulous areas located posterior to the natural teeth

Class II: Unilateral edentulous areas located posterior the natural teeth

Class III: Unilateral edentulous area located either anterior or posterior but not crossing the midline

Class IV: A single bilateral (crossing the midline) edentulous area located anterior to the remaining natural teeth.

Periodontal parameters of abutment and non-abutment teeth were also noted. The non-abutment teeth were defined as teeth immediately adjacent to the abutment teeth on the same arch [16].

Periodontal status recordings were done on the four surfaces (buccal, lingual, mesial and distal) of all abutment and non-abutment teeth. The reading was recorded by two trained dentists in periodontology clinic, who had been required to take several readings before commencement of data gathering. Their readings were found to be strongly correlated. The scoring was done using indices for measuring periodontal parameters.

The indices included Simplified Oral Hygiene Index of Greene and Vermillion [17] and Probing Pocket Depth (PPD) [18].

The plaque / debris component of the Simplified Oral Hygiene Index of Greene and Vermillion [17] was used. We utilized only the plaque/ debris component of the oral hygiene index.

Excellent = 0
Good = 0.1 -0.6
Fair = 0.65 -1.5
Poor = 1.55 -3.0

Probing Pocket Depth (PPD) [18]

This is the distance from the gingival margin to the base of the periodontal pocket and was measured in mm using a Williams periodontal probe. The proportion of sites (mesiobuccal, midbuccal, distobuccal, mesiolingual, midlingual, distolingual) with PPD \geq 4 mm were recorded and mean values were calculated for abutment and non-abutment teeth.

These clinical measurements were taken immediately before placement of acrylic removable partial dentures (ARPDs).

Data analysis

Data collected was analyzed with IBM SPSS 20 statistical software's for windows (version 16.0 SPSS Inc, Chicago IL). Kurtosis normality test was done, frequency distributions were generated. Mean and standard deviations were calculated where appropriate. Student t tests and One-way ANOVA were used to detect differences between associations of continuous variables. The statistical significance of outcomes was evaluated at 95% confidence interval and the level of significance was set at $p < 0.05$.

Ethical considerations

Ethical approval was obtained from the Health Research and Ethics Committee of the Lagos University Teaching Hospital. Informed consent (both written and verbal) was obtained from the patients before the commencement of the study.

Results

Sixty-one participants with mean age of 60.9 ± 14.27 years, and age range from 21 to 71 years were seen. Thirty-six (59 %) were males (Table 1). Mean and standard deviation of oral hygiene, probing depth of abutment and non-abutment was 2.37 ± 1.15 , 2.40 ± 1.30 and 2.24 ± 1.24 respectively. Kurtosis test for probing depth of abutment teeth was 0.65 (SE = 0.62), non-probing depth was 1.32 (SE = 0.62) and oral hygiene was 0.15 (0.62). Majority (96.8%) brushed with toothbrush only, 51.5% brushed once a day and 57.4% had Kennedy class III (Table 1). Mean of oral hygiene index was 2.37 ± 1.15 (Table 2). Table 3 shows the association of oral hygiene, frequency of brushing and location edentulous space using Kennedy classification. Majority of those who brushed once had poor oral hygiene ($p < 0.0001$) and most of those who had Kennedy Class III had poor oral hygiene ($p = 0.03$). The mean probing depth of abutment (2.4 ± 0.16) and non-abutment teeth (2.24 ± 0.16) were significantly ($p < 0.001$) (Table 4). Differences in the probing depth of abutment ($F = 0.46$), non-abutment teeth ($F = 1.11$) and oral hygiene ($F = 1.13$) within different Kennedy edentulous group were not significant ($p = 0.71$, $p = 0.35$, $p = 0.34$ respectively) (Table 5).

Discussion

In this study the mean probing depth of prospective abutment teeth was higher than non-abutment teeth. Previous studies [19-21] demonstrated no difference in pocket depth of abutment and non-abutment teeth. These studies were done in patients wearing removable partial dentures and some factors that facilitated these results included good and appropriate oral hygiene [20,21], adequate clinical follow up [21], good removable partial denture design principle-simple design, rigid connectors and adequate denture fit [19]. Some studies [22,23] noted an increase in probing depth in patients wearing removable partial dentures and it was worst on the abutment teeth [23].

Table 1: Sociodemographics and Oral Hygiene of Participants

Sociodemographic factors	Frequency(%)
<i>Age range</i>	
21-30	4(6.6)
31-40	3(4.9)
41-50	8(13.1)
51-60	11(18.0)
61-70	17(27.9)
71-80	15(24.5)
81-90	3(4.9)
<i>Sex</i>	
Male	36(59%)
Female	25(41%)
<i>Education</i>	
Primary	7(11.5)
Secondary	6(9.8)
Tertiary	26(42.6)
Others	22(36.1)
<i>Ethnicity</i>	
Hausa	1(1.6)
Igbo	18(29.5)
Yoruba	39(63.9)
Other	3(4.9)
<i>Means of Cleaning Teeth</i>	
Toothbrush	60(96.8)
Toothbrush and Chewing Stick	1(3.2)
<i>Toothbrush frequency</i>	
Once daily	32(51.5)
Twice daily	29(48.5)
<i>Oral Hygiene (modified)</i>	
Good	2(3.2)
Fair	14(23.0)
Poor	45(73.8)
Total	61(100)
<i>Kennedy Classification</i>	
Class I	8(11.8)
Class II	15(22.0)
Class III	39(57.4)
Class IV	6(8.8)
<i>Dental Arch</i>	
Upper	24(35.3)
Lower	44(64.7)
Total	68(100)

In this study, edentulous spaces were studied prior to replacement of the missing teeth. The prospective abutment teeth were expected to be more accessible to participants for better oral hygiene measures. Interestingly, however, our finding was contrary as the periodontal status was poorer which could be attributed to inadequate/less than optimal oral hygiene measures

particularly without the adjunctive use of interdental brushes around these prospective abutment teeth. However, restoration of missing teeth with removable partial dentures is still preferred to non-replacement of tooth especially when aesthetics and mastication is being compromised [24,25].

Another finding in this study was the association of frequency of brushing and oral hygiene. The importance of regular and particularly twice daily brushing in improving oral hygiene through reduction in dental plaque level has been documented statistically [26] and clinically [27]. The finding of the majority of those who brushed once daily with poor oral hygiene in the present study was therefore not surprising. A larger proportion of participants in this study used toothbrush only while one participant used chewing stick and toothbrush. There has been documentation on the frequency of brushing and plaque control [28]. Toothbrushing once a day is sufficient to maintain oral health but twice a day is suggested to improve plaque control [27]. It has also been documented that dental floss in addition to toothbrush reduces gingivitis, although this evidence is weak [29,30].

The probing depth of prospective abutment located adjacent to edentulous space had higher mean probing depth. Location of edentulous space had influence on oral hygiene. Our finding also shows poor oral hygiene more on patients with Kennedy Class III edentulous saddle area, which is an edentulous area bounded on both ends with teeth. It is suggested that the positioning of this edentulous area might make it difficult for proper cleaning and increase risk of oral debris stagnation and emphasis should be placed on oral hygiene measures especially in prospective patients with Kennedy Class III edentulous saddle.

A previous study [30] determining association of oral hygiene measures and periodontal status reported an association between frequency of brushing and periodontal disease. It reported a low prevalence of periodontal disease and tooth brushing three times or more in a day. More than half of our participants brushed twice a day and a significant association was found between the frequency of brushing and oral hygiene. The periodontal status of prospective abutment teeth was also poorer than non-abutment teeth, suggesting that more attention and oral hygiene measures should be instituted for prospective abutment teeth. Though, there were a few of drawbacks during this study such as attrition of participants, this study still gives background information for further study of

Table 2: Comparison of Oral hygiene index, probing depth of prospective abutment and non-abutment teeth indices.

Variables	Mean	N	Standard Deviation	Skewness	Range	Minimum	Maximum
Oral hygiene index	2.37	61	1.15	0.56	5.7	0.0	5.7
Probing depth of abutment teeth	2.40	61	1.30	0.72	5.9	0	5.9
Probing depth of non abutment teeth	2.24	61	1.24	1.03	5.6	0.5	6.10

Table 3: Relationship between oral hygiene, tooth brushing and location of edentulous spaces (Kennedy classification)

	Oral hygiene			Total	Df	Chi square	P value
	Good	Fair	Poor				
<i>Frequency of brushing</i>							
Once	1	5	26	32	6	64.12	<0.0001
Twice	1	9	19	29			
Total	2	14	45	61			
<i>Kennedy Classification</i>							
Class I	0	5	2	7	6	13.9	0.03
Class II	3	0	10	13			
Class III	2	4	30	36			
Class IV	0	2	3	5			
Total	5	11	45	61			

Table 4: Periodontal probing depths of abutment and non-abutment teeth

	Mean	SD	Std Error Mean	Correlation	Level of Significance			
Probing depth abutment teeth	2.40	1.30	0.16	0.65	<0.0001			
Probing depth non-abutment teeth T test.	2.24	1.24	0.15					
Pair	Mean	SD	Std. Error Mean	95% CI Lower	95% CI Upper	t	df	p value
Probing depth abutment	0.16	1.60	0.13	-0.10	0.42	1.22	66	0.23
Probing depth non- abutment								

CI: Confidence Interval

periodontal status, of prospective abutment teeth and non-abutment teeth in partially edentulous patients scheduled to have removable prosthesis.

Conclusion

The study found a significant difference between probing depths of prospective abutment teeth and non-abutment teeth with no association to the location of edentulous area on dental arch. It is also found a

Table 5: Periodontal probing depths of abutment, non-abutment and oral hygiene

Variables	Sum of Squares	Df	Mean Square	F	Sig
Probing depth abutment	2.42	3	0.81	0.46	0.709
Probing depth of non-abutment	5.11	3	1.70	1.11	0.351
Oral Hygiene	4.79	3	1.60	1.13	0.346

significant association between frequency of brushing and oral hygiene. It is suggested that continuous oral hygiene measure should be instituted for prospective abutment teeth while promoting the use of interdental cleaning aids such as interdental brushes to facilitate plaque removal from these abutment teeth.

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Received = 18h March 2020

Accepted = 31st August 2020