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The Effectiveness of Periodontal Treatment to Improve Glycated Hemoglobin a Levels in Diabetes Patients

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ABSTRACT

Objective: Periodontal disease and diabetes are two chronic pathologies with good established bidirectional relationship. Periodontal treatment in diabetic patients would contribute to a decrease in glycated hemoglobin (HbA1c) level and to the prevention of diabetic complications. The aim of this study is to evaluate the clinical results of the periodontal treatment in diabetic patients with uncontrolled glycemia and to study its impact on diabetes mellitus control.

Methods: 32 eligible diabetic patients with uncontrolled glycemia aged 18-65 years (mean age: 51.87±10.01 years) have participated in this study. Clinical variables included HbA1c, plaque index (PI), gingival index (GI), pocket probing depth (PPD), bleeding on probing (BoP) and tooth mobility. After initial examinations, patients were received a non-surgical periodontal treatment. Patients were then recalled after treatment to assess PI and GI at 15 days, 30 days and 60 days and to assess all variables at 3 months. All patients benefited from oral hygiene instructions in every recall.

Results: A significant improvement was observed between the periodontal variables at baseline and at 3 months after the non-surgical periodontal treatment. After non-surgical periodontal treatment; PI decreased from 1.85±0.22 to 0.97±0.28 ($p<0,05$), and GI decreased from 1.94±0.43 to 0.91±0.21 ($p<0.05$). Also HbA1c level concurrently decreased significantly from 7.98±0.46 to 7.66±0.41 ($p<0,05$).

Conclusion: Good oral hygiene control and periodontal treatment may help diabetic patients to control Hb1Ac levels.

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Introduction

Periodontitis is an inflammatory infectious disease, which cause the breakdown of the periodontium due to bacterial plaque accumulation on tooth surface [1]. Periodontitis and diabetes are two chronic pathologies with good established bidirectional relationship [2, 3]. The interrelation between diabetes and periodontal diseases was highlighted in 1993 by the American Diabetes Association, which recognized periodontal disease as the sixth most common complication of diabetes [4]. Thus, diabetes is a major risk factor for periodontal disease. Indeed, periodontal diseases have also a negative impact on diabetes control. This bi-directional influence between these two pathologies was approved in 2013 by the consensus report of the European Federation of Periodontology (EFP) and the American Academy of Periodontology (AAP) Workshop on systemic diseases and periodontitis [2]. Recently, it was supported in 2018 by the update of the new classification of periodontal diseases and peri-implant diseases and conditions of the EFP [5]. The risk of developing periodontitis is tripled when the glycated hemoglobin (Hb1AC) level exceeds 9% [6]. The severity of periodontal disease is also positively correlated with Hb1AC level [7].

Several studies have shown that adequate periodontal treatment in diabetic patients would contribute to a decrease in Hb1AC level and to the prevention of diabetic complications [6, 8-12].

The aim of this study is to evaluate the clinical results of the initial periodontal therapy in diabetic patients with uncontrolled glycemia and to study its impact on diabetes mellitus control.

Materials and Methods

Study Population

32 eligible diabetic patients aged 18-65 years (mean age: 51.87±10.01 years) with uncontrolled glycemia (Hb1AC≥7%) consulting at the periodontics department of the University of Hassan II of Casablanca, Morocco have participated in this

prospective study. 32 patients (from 78) were available at 3 months of follow-up. Smoker patients or patients presenting other systemic risk factors were excluded from the study.

Data Collection

Consenting patients were interviewed. A questionnaire was used to collect general, dental and periodontal health data. Then, clinical examination was performed to evaluate their periodontal status. Clinical variables included glycated hemoglobin (HbA1c), plaque index (PI), gingival index (GI), pocket probing depth (PPD), bleeding on probing (BoP) and tooth mobility [13-15]. A manual Williams periodontal probe colour-coded at 1, 2, 3, 5, 7, 8, 9, and 10 mm was used to record PPD. BoP was evaluated similarly to PPD scoring. Sites that bled after probing were recorded. The periodontal examination was evaluated at six sites per tooth on all permanent teeth, excluding third molars. Clinical examinations were performed by a same examiner (OM) in the periodontics department. This examiner was calibrated by an experienced periodontist. Data were first recorded on paper forms and then entered into a computer. After initial examinations, patients were received a non-surgical scaling and root planing treatment associated to oral antibiotic administration. Patients were then recalled after treatment to assess PI and GI at 15 days, 30 days and 60 days and to assess all variables at 3 months. All patients benefited from oral hygiene instructions in every recall.

Data Analysis

Statistical analysis was performed using Epi-info software. The Chi-square test/Fisher exact test were used to compare HbA1c with other explanatory variables like sociodemographic traits, oral hygiene status, and periodontal status. One-way ANOVA was carried out to determine any statistical significance with other continuous variables. The threshold for statistical significance was set at $p<0.05$.

Ethical Review

The protocol of the study was reviewed and approved by the Ethical Review Committee at the Faculty of Dentistry, University of Hassan II of Casablanca, Morocco. All patients were informed about the survey and only consenting ones participated in this study.

Results

The study subjects comprised 32 diabetic patients with uncontrolled glycemia (20 (62,5%) females and 12 (37,5%) males), and their age range was 18 to 65 years (mean: 51,87 ±10,01 years). 9 (28,13%) subjects have an aggressive periodontitis (AgP) and 23 (71,87%) subjects have a chronic periodontitis (ChP) (Table 1). 14 (43,75%) subjects brush their teeth twice a day or more, 10 (31,25%) once a day and 8 (25%) less frequently. Tables 2 and 3 show the general diabetes history and basic characteristics of the study population according to the glycated haemoglobin (Hb1Ac).

Table 1: Distribution of the Sample by Periodontal Diagnosis

Periodontal Disease	n	%
Agressive Periodontitis	9	28.13
Chronic Periodontitis	23	71.87

Table 2: General Diabetes History

Characteristics	n	%
Diabetes Type		
Type 1	8	25
Type 2	24	75
Duration of Diabetes (Years)		
< 5	4	12.5
[5- 10]	18	56.25
>10	10	31.25
BMI (kg/ m²)		
Lean Body Type 16,5-18,4	0	0
BMI Normal 18,5-25	18	56.25
Overweight 25-30	14	43.75
Complications		
Ophthalmologic	14	63.63
Renal	6	27.27
Neurological	1	4.54
Cardio-vascular	1	4.54

BMI: Body Mass Index

Table 3: Basic characteristics of the study population according to the glycated haemoglobin (Hb1Ac)

	n (%)	Mean Hb1Ac±SD	p
Gender			
Male	12 (62.5%)	8.04±0.22	
Female	20 (37.5)	7.94±0.21	0.55833
Age			0.66000
[18 -40 years]	5 (15.62%)	7.80±0.08	
[41 -50 years]	9 (28.12%)	8.00±0.18	
[51 -65 years]	18 (56.25%)	8.01±0.27	
BMI (kg/ m²)			0.22812
BMI normal 18.5-25	18 (56.25%)	8.08±0.22	
Overweight 25-30	14 (43.75%)	7.86±0.20	
Duration of diabetes (years)			
< 5	15 (46.87%)	7.90±0.16	
[5- 10]	9 (28.12%)	7.85±0.23	0.13248
>10	8 (25%)	8.26±0.24	

Hb1Ac: glycated haemoglobin, SD: Standard deviation, BMI: Body Mass Index

Changes in Periodontal Variables

The results demonstrated an improvement in all periodontal variables after the non-surgical periodontal treatment (Tables 4-5). A very significantly improvement was observed between the periodontal variables at baseline and at 3 months after the non-surgical periodontal treatment ($p<0.001$) (Table 6). Figures 1 and 2 show the evolution of plaque index (PI) and gingival index (GI) during the follow-up period [13, 14]. The mean PI shifted from 1.85±0.22 to 0.97±0.28 at baseline and at 3 months of follow-up, respectively ($p<0.001$). A very significantly decrease was noted also for the GI (1.94±0.43 at baseline and 0.91±0.21 at 3 months of follow-up) ($p<0.001$). Regarding pocket probing depth (PPD), only 2 subjects (6.25%) had persistent pockets ≥6mm at 3 months of follow-up. At baseline, 7 (21.88%) and 24 (75%) subjects had mobility degree 3 and degree 2 (15), respectively. At 3 months of follow-up, only 22 (68.75%) had mobility degree 2 and no one had mobility degree 3 [15].

Table 4: Pocket probing depth at baseline and 3 months after non surgical periodontal treatment

PPD	n	%
PPD ≤ 3mm		
At baseline	0	0
After 3 months	3	9.31
PPD [4-6mm]		
At baseline	4	12.5
After 3 months	27	84.37
PPD ≥ 6mm		
At baseline	28	87.5
After 3 months	2	6.25

PPD: Pocket probing depth

Table 5: Gingival bleeding at baseline and 3 months after non surgical periodontal treatment

Gingival bleeding	Absent n (%)	BoP n (%)	Spontaneous bleeding n (%)
At baseline	0 (0)	23 (71.88)	9 (28.13)
After 3 months	7 (21.88)	25 (78.13)	0 (0)

BoP: Bleeding on probing

Table 6: Clinical periodontal status and glycated haemoglobin at baseline and 3 months after non surgical periodontal treatment

Variables	Mean	Difference	p
Plaque index			
Baseline	1.85 ±0.22	0.87 (±0.25)	<0.001
After 3 months	0.97 ±0.28		
Gingival index			
Baseline	1.94 ±0.43	1.02 (±0.34)	<0.001
After 3 months	0.91 ±0.21		
PPD			
Baseline	4.64 ±0.54	1.35 (±0.42)	<0.001
After 3 months	3.28 ±0.23		
BoP			
Baseline	91.14 ±15.96	67.25 (±18.75)	<0.001
After 3 months	23.89 ±21.19		
Hb1Ac			
Baseline	7.98 ±0.46	0.31 (±0.44)	0.00601
After 3 months	7.66 ±0.41		

PPD: Pocket probing depth, BoP: Bleeding on probing, Hb1Ac: glycated haemoglobin,

Changes in glycated hemoglobin (Hb1Ac)

A statistically significant ($p<0.05$) improvement was noted in mean Hb1Ac after the non-surgical periodontal treatment. The mean Hb1Ac shifted from 7.98±0.46 to 7.66±0.41 at baseline and at 3 months of follow-up, respectively (Table 6)

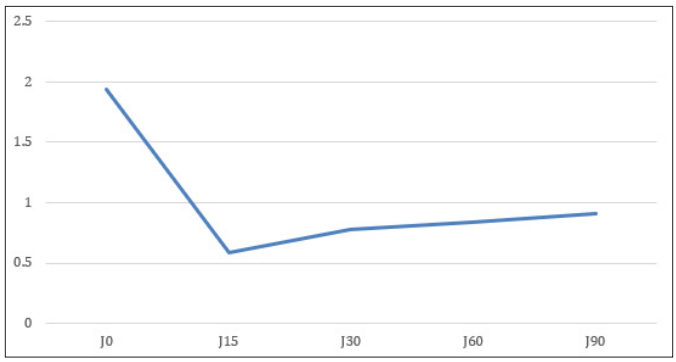

Figure 1: Evolution of Plaque Index between J0 and J90.

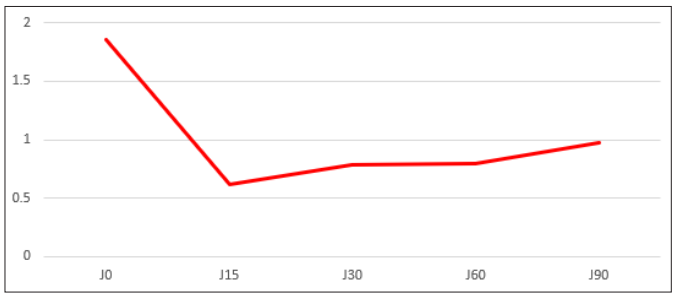

Figure 2: Evolution of Gingival Index between J0 and J90.

Discussion

The data from the study demonstrated an improvement in all periodontal variables after the non-surgical periodontal treatment. A very significantly improvement was observed between the periodontal variables at baseline and at 3 months after the non-surgical periodontal treatment ($p<0.001$). Regarding the Hb1Ac levels, a statistically significant reduction was noted at 3 months of follow-up ($p<0.05$). These results are in accordance with the literature data. Numerous investigations were done in this issue to assess the bi-directional relationship between eriodontitis and diabetes. In their randomized clinical trial (RCT), Kaur et al have evaluated the glycemic effects of the periodontal treatment in Type 2 diabetes patients [9]. In patients treated group, the authors reported that Hb1Ac shifted by 10.8% at 6 months of follow-up. Tsobgny-Tsague et al conducted also a RCT on 34 Type 2 diabetes sub Saharan African patients with poor glycemic control [11]. The results of their study showed a significantly improvement of Hb1Ac level after periodontal treatment. Most of published studies included chronic periodontitis and Type 2 diabetes patients. The present study included both chronic (71.87%) and aggressive periodontitis (28.13%) patients affected by Type 1 (25%) or Type 2 (75%) diabetes mellitus. Pocket probing depth is a crucial clinical sign of periodontal breakdown. This parameter could be considered as a risk indicator for HbA1c levels in diabetic patients [12]. Data from our study showed that only 2 subjects (6.25%) had persistent pockets ≥6 mm at 3 months of follow-up. Periodontal diseases have a significant impact on the metabolic status of diabetes mellitus through the chronic release of inflammatory mediators. It may lead to resistance to the insulin action causing a chronic hyperglycemia, which would constitute a risk for the development of diabetic complications. On the other hand, poor controlled glycaemia is associated with the risk of developing periodontal diseases with more advanced breakdown

[16]. Improving Hb1Ac levels in diabetic patients could prevent from periodontal diseases as well as good oral hygiene control and periodontal treatment help the diabetic patient to control Hb1Ac levels and avoid diabetic complications.

Based on the current evidence and on the data from the present study, it seems to be reasonable to establish clinical guidelines for periodontal health care in diabetic patients for both endocrinologists and dental surgeons.

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