

## A CORRELATION BETWEEN FASTING BLOOD GLUCOSE AND PERIODONTAL FINDING IN DIABETIC PATIENTS HAVING CHRONIC PERIODONTITIS AND TREATED WITH (TRAUMEEL) DRUG

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### **ABSTRACT**

**Objective** to investigate the influence of Traumeel drug as adjunctive to non surgical periodontal intervention in patients with poorly controlled type 2 diabetes associated with chronic periodontitis on both periodontal parameters and metabolic findings, and to correlate the levels of fasting blood glucose (FBG) , and fasting blood insulin (FBI) to the clinical periodontal parameters in those patients after treatment.

**Methods and Patients** A total of 20 patients having moderately poorly controlled (HbA1c between 8%-10%) type 2 diabetes mellitus associated with moderate to severe chronic periodontitis were selected and randomly divided into two groups according to whether they underwent periodontal intervention alone (control group) or periodontal intervention adjunctive to traumeel tablets with a dose of 1 tablet 3 times daily for 1 week. The levels of serum tumor necrosis factor  $\alpha$  (TNF- $\alpha$ ), FBG,FBI and glycosylated hemoglobin(HbC1) were measured at baseline and after 3 months. The periodontal parameters including Probing pocket depth(PPD) Clinical attachment loss (CAL) and Modified Gingival index (MGI) were also measured at baseline and after 3 months

**Results** The levels of both metabolic parameters and clinical periodontal parameters were improved significantly in both test and control groups after 3 months but on comparing percent of change D at  $p \leq 0.05$  between control and tablet groups after 3 months ,test group showed more reduction in all parameters except Hbc1 compared to control group .There were also a statistically significant correlation between periodontal parameters and FBG and FBI in the test group only.

**Conclusion** The adjunctive use of homeopathic Traumeel tablets with periodontal intervention offered better results concerning periodontal and metabolic state .

**KEY WORDS:** Type 2 diabetes mellitus, chronic periodontitis, FBI, FBG, and Hbc1.

### **INTRODUCTION**

Periodontitis is a common chronic inflammatory disease, caused by gram-negative infection and

characterized by periodontal pocket formation, loss of connective tissue attachment and alveolar bone resorption which can result in tooth mobility.<sup>(1)</sup>

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Diabetes mellitus (DM) is a clinically and genetically heterogeneous group of metabolic disorders manifested by abnormally high levels of glucose in the blood. The hyperglycemia is the result of a deficiency of insulin secretion caused by pancreatic  $\beta$ -cell dysfunction or resistance to the action of insulin in peripheral tissue or a combination.<sup>(2)</sup>

DM is either type 1 or type 2, type 2 diabetes was known previously as non insulin-dependent diabetes. It is now known that type 2 diabetic patients have insulin resistance which is considered to play central role in its pathogenesis, while autoimmune destruction of  $\beta$  cells does not occur, and patients retain the capacity for some insulin production.<sup>(3)</sup>

Authors have reported a bidirectional relationship between the mechanism of type 2 diabetes and periodontitis as not only DM adversely affects periodontal condition but also periodontitis adversely influences glycemic control, increasing the risk of complications in diabetic Patients.<sup>(4)</sup>

Several findings indicate that chronic low-grade inflammation is closely involved not only in the pathogenesis of type 2 DM and its complications,<sup>(5)</sup> but also in the pathogenesis of periodontal diseases, whereby cytokines play a central role in the host's response to the periodontal biofilm.<sup>(5-7)</sup>

Evidence suggests that Tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) has been implicated as a causative factor in pathogenesis of type 2 diabetes. Thus, current evidence suggests that administration of exogenous TNF- $\alpha$  to animals can induce insulin resistance, whereas neutralization of TNF- $\alpha$  can improve insulin sensitivity.<sup>(8)</sup>

It was found also that (TNF- $\alpha$ ) is a major mediator of the immune-inflammatory response and play an important role in the pathogenesis and progression of chronic periodontal disease (PD).<sup>(6)</sup>

On the other hand free radicals are considered to be a common factor in the pathogenesis of both periodontitis and diabetes mellitus. Bacteria

implicated in the etiology of periodontitis causes destruction of connective tissue and bone which occur through stimulation of polymorphonuclear neutrophils (PMN). Polymorphonuclear neutrophils produces free radicals via respiratory burst as a part of host response to infection. These free radicals damage proteins, lipids, carbohydrates and nucleotides in the tissues.<sup>(9-12)</sup>

Free radicals may also play an important role in the causation and complications of DM.<sup>(10-13)</sup> In DM, alterations in the endogenous free radical scavenging defense mechanisms may result in oxidative damage and severe tissue injury.<sup>(11-13)</sup>

Homeopathy is a form of alternative therapy which comes from the Greek words *homeo*, meaning similar, and *pathos*, meaning suffering or disease. Homeopathy seeks to stimulate the body's ability to heal itself by giving very small doses of highly diluted natural substances. The principle of dilutions (or "law of minimum dose") states that the *lower* the dose of the medication, the *greater* its effectiveness.<sup>(14)</sup>

Traumeel, is a homeopathic remedy that is made of a mixture of 12 botanical and two mineral substances in micro- or ultra low-dilutions. Traumeel results in rapid reduction of inflammation and healing promotion. It has also a pronounced analgesic, antiedematous effects. Thus it is considered to be a potent anti-inflammatory.<sup>(15)</sup>

Mode of action of Traumeel was proved in various clinical applications which suggests that Traumeel works in a different way compared to non steroid anti-inflammatory drugs (NSAIDs). Traumeel and its constituents exert bioregulatory effects via the inhibition of various proinflammatory cytokines, such as interleukin IL-2, IL-6, and tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ). It can also perform modulation of regulatory cells/transforming growth factor- $\beta$  (TGF- $\beta$ ); and inhibition of IL-8 as proved with Ludmila, et al 2004 who used Traumeel in the management of patients with chronic periodontitis and reached an excellent results.<sup>(16)</sup>

More over Traumeel was proved to be an anti-oxidant as it can significantly reduce production of superoxide anion by peripheral blood polymorphonuclear neutrophils of periodontitis patients.<sup>(17)</sup>

Thus as both oxidative stress and inflammatory cytokines can worsen the glycemic control of diabetic patients therefore decreasing them by traumeel drug can improve the glycemic control of those patients. Also evidence suggests that periodontal therapy can decrease the intraoral bacterial bioburden, periodontal inflammation, and inflammatory cytokines, and so can improve glycemic control so the study hypothesis is about the positive impact of adding traumeel drug as an antioxidant and anti-inflammatory drug to the treatment protocol for type 2 DM having chronic periodontitis.<sup>(18)</sup>

### Objectives:

This study attempts to investigate the influence of Traumeel drug as adjunctive to non surgical periodontal intervention in patients with poorly controlled type 2 diabetes associated with chronic periodontitis on both periodontal parameters and metabolic findings, and to correlate the levels of FBG and FBI to the clinical periodontal parameters in those patients after treatment.

## MATERIALS AND METHODS

### Study design

The study design is controlled clinical trial so a total of 20 patients having type 2 diabetes mellitus associated with chronic periodontitis were selected from the oral medicine and periodontology department, faculty of dentistry, Alexandria University.

The patients were selected according to the following criteria:

Patients having moderate to severe chronic periodontitis,<sup>(19)</sup> associated with moderately poorly controlled type 2 DM (HbA1c between

8%-10%)<sup>(18)</sup> and with nearly of the same duration of diabetes (about 5 years).

Patients age range was from 45-65 years old and they were non smokers and free from any other systemic diseases or diabetic complications. Moreover those reporting intake of any medications other than oral hypoglycemic drugs, or treated with insulin injection were excluded. They should not receive any surgical or non surgical periodontal treatment in the previous 12 months but with no evidence of periapical or periodontal abscess.

The selected patients were classified randomly into 2 groups as follow:

**Group 1 (control):** Comprised 10 patients (9 females and 1 male) who were subjected to non surgical periodontal management (phase I therapy).

**Group 2 (test):** Comprised 10 patients (9 females and 1 male) who received systemically administrated homeopathic remedy (Traumeel tablets) (Fig.2) adjunctive to phase I therapy with a dose of 1 tablet 3 times daily for 1 week.

### Materials:

Traumeel drug is a homeopathic remedy which had been used in the present study (Biologische Heilmittel Heel GmbH company, Baden-Baden, Germany, www.heel.com). Traumeel s is composed of *many botanical* natural materials and *minerals*.<sup>(20)</sup> such as:

Hamamelis, Echinacea, Aconitum napellus (Aconite), Hepar sulfuris Arnica (mountain arnica) which have anti-inflammatory, analgesic, antiviral, antibacterial, antioxidant effects and can also stimulate the healing of wounds.

### Methods

The study was approved by the committee of ethics and an informed consent was obtained from each patient after providing detailed information and description of the study.

All patients were subjected to the following steps:

**A) Clinical periodontal examination which included**

Probing pocket depth (PPD) <sup>(21)</sup>, Clinical attachment loss (CAL) <sup>(21)</sup> and Modified Gingival index (MGI).<sup>(22)</sup> of all the remaining teeth were measured at Six sites and the average was calculated before treatment and after 3 months of follow up.

**B) Laboratory investigations which included:**

Glycosylated hemoglobin, was used to evaluate if there is improvement in glycemic control, while Fasting blood glucose level and fasting blood insulin level were used to evaluate if the periodontal treatment in group one or two has a direct effect on blood glucose level and fasting blood insulin which are considered to be an indicator for improvement in insulin resistance. The Blood samples were taken after overnight fasting and the levels of the following compounds were measured at baseline and after 3 months for the two groups. Moreover the level of serum TNF-  $\alpha$  was also assessed before treatment and after 3 months of follow up.

**C) Periodontal treatment which included:**

Non surgical periodontal management was in form of phase I therapy including: plaque control, full mouth supra and subgingival scaling, root planing and coronoplasty when needed.

**Statistical analysis:**

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. **Student t-test** was used to compare two groups for normally distributed quantitative variables. **Paired t-test** and **ANOVA** and Post Hoc test (**LSD**) was assessed for comparison between different periods. **Mann Whitney test** was used to compare between two groups for abnormally distributed quantitative variables. **Pearson coefficient** was used to correlate between quantitative variables. Significance of the obtained results was judged at the 5% level.

**RESULTS**

A total of 20 patients having type 2 diabetes mellitus associated with periodontitis (2 males and 18 females) were evaluated in the present study. They were divided into two groups: **group 1 (control)** Comprised 10 patients 9 females and 1 male who were subjected to non surgical periodontal management in the form of phase I therapy while **group 2 (test)** Comprised 10 patients 9 females and 1 male who received systemically administrated Traumeel tablets.

Concerning the drug used in the present study, no adverse reactions were reported. The gingival tissues in all selected sites appeared healthy with no signs of inflammation.

Table 1 shows a comparison between the test and control group at base line and after a follow up period of 3 months regarding the main periodontal characteristics and lab investigations.

The levels of clinical periodontal variables including PPD, CAL, and MGI, were improved significantly in both groups test and control after 3 months (fig.1-4) (at  $p \leq 0.05$ ) and on comparing those variables after 3 months the difference between the 2 groups was statistically significant( at  $p \leq 0.05$ ).

Concerning FBG, FBI and glycosylated Hb(Gly.) all of them decreased significantly after treatment in both groups (at  $p \leq 0.05$ ). On comparing those variables after 3 months the difference between the 2 groups was statistically significant for FBI while for FBG and Glycosylated Hb; it was not statistically significant( at  $p \leq 0.05$ ).

Regarding serum and crevicular TNF both of them decreased significantly after treatment in both groups (at  $p \leq 0.05$ ) and on comparing them after 3 months there was a statistically significant difference between the 2 groups (at  $p \leq 0.05$ ).

On the other hand on comparing **D** between the 2 groups there was a statistically significant difference in all mentioned variables except crevicular TNF and Glycosylated Hb.





Fig. (1) Preoperative CAL in control group



Fig. (2) CAL after 3 months in control group



Fig. (3) Preoperative CAL in test group



Fig. (4) CAL after 3 months in test group

## DISCUSSION

Diabetes mellitus is a metabolic diseases which characterized by hyperglycemia resulting from defect in insulin secretion, action or both.<sup>(23)</sup> It is often associated with an unacceptably high disease burden especially in developing countries. In Egypt it is considered a major clinical and public health problem.<sup>(24)</sup>

Periodontal disease is a chronic oral infectious disease and considered as the sixth complication of diabetes. Both diseases are of high incidence and the incidence of diabetes associated with periodontal disease has an upward trend among old people.<sup>(23)</sup>

Evidence has consistently indicated that diabetes

is a risk factor for increased severity of gingivitis and periodontitis.<sup>(25,26)</sup> Conversely, periodontitis may be a risk factor for worsening glycemic control among patients with diabetes and may increase the risk of diabetic complications.<sup>(26,27)</sup> Thus the relation between periodontal health and diabetes has been described as bidirectional.<sup>(28)</sup>

Traumeel is a homeopathic remedy that represent a good example of bioregulatory medicine through modulating inflammatory pathways by down-regulating proinflammatory cytokines and up regulating anti-inflammatory cytokines,<sup>(29-31)</sup> More over Žilinskas J etal (2011)<sup>(17)</sup> proved that traumeel had an antioxidant effect thus using traumeel with its antioxidant and anti-inflammatory properties

was very beneficial for periodontitis treatment and so improving patients Glycemic control, FBG and FBI according to the results of this study.

In the present study, we noted that PPD, CAL, and MGI were significantly decreased in the test group and control group after 3 months as well as the HbA1c, serum and crevicular TNF- $\alpha$ , concerning FBG and FBI levels they also decreased and are a good indication for the improvement of insulin resistance as when the FBI decrease this means that more insulin start to enter the cells to start to consume it for energy production which occur only when insulin resistance decrease.

These results confirmed our hypothesis that periodontal treatment not only reduces clinically evident inflammation, but also improves the glycemic control and reduces insulin resistance (IR). These findings indicate that inflammation is involved in the pathogenesis of both DM and periodontitis.

Moreover on comparing **D** between the 2 groups there was a statistically significant difference in all mentioned variables except crevicular TNF and Glycosylated Hb which proves that traumeel drug when used adjunctive to conventional periodontal treatment had provided more reduction in both clinical and laboratory variables than periodontal treatment alone due to its anti-inflammatory and antioxidant effect.

This study also proved the presence of a statistically significant positive correlation between the **D** of FBG and FBI as an indicator for insulin resistance and the **D** of periodontal findings including CAL, PPD and MGI in traumeel drug group which confirm the study hypothesis about the positive impact of adding traumeel drug as an antioxidant and anti-inflammatory drug to the treatment protocol for type 2 DM having chronic periodontitis. Thus traumeel drug in a conjunction to phase 1 periodontal therapy had led to both improvement in periodontal health and improvement in patients FBG and FBI due to reduction in IR.

FBG and FBI are considered as an indicator for insulin resistance because it is well known that IR is usually evaluated by the HOMA index (homoeostasis model assessment of the IR index, HOMA-IR), that depend on the values of FBG and FBI and so reduction in both results in reduction in IR.<sup>(18)</sup>

There is an agreement between our results and those obtained by OU Long et al (2011)<sup>(32)</sup> who investigate the effect of periodontal treatment on levels of blood glucose (Glu) and glycosylated hemoglobin (HbA1c) among elderly patients with type 2 diabetes and periodontal disease. They used anti-inflammatory drugs, such as iodine glycerin or Perioline placed into periodontal pocket adjunctive to subgingival scaling, root planing and removal of infected tissue and occlusal adjustment. They found that periodontal treatment can effectively reduce the level of Glu and HbA1c as well as improve the periodontal condition by reducing probing depth (PD), attachment loss (AL) significantly, in elderly type-2 diabetes patients with periodontal disease.

However, Jones et al indicated that periodontal therapy has no statistically significant effect on glycemic control<sup>(33)</sup>. This could be attributed to considerable differences in methodology, sample sizes and composition of the groups included in the studies.

More over our results are also close to that reached by Sun WL et al (2011)<sup>(18)</sup> who conducted a study to evaluate the effects of periodontal intervention in form of scaling and root planing on inflammatory cytokines, insulin resistance (IR), and metabolic control (HbA1c) and to investigate the relationship between type 2 diabetes mellitus (T2DM) with moderately to poor glycemic control and chronic periodontitis. They concluded that Periodontal intervention can improve glycemic control through reducing HbA1c, lipid profile, IR, serum inflammatory cytokine levels specially IL-6 and TNF- $\alpha$  in moderately poorly controlled T2DM patients.

## CONCLUSION

Traumeel drug proved to have no adverse effects on patients with type 2 DM associated with chronic periodontitis during the entire study period (3 months). The adjunctive use of homeopathic traumeel tablets with periodontal intervention offered better results concerning periodontal and metabolic state. Moreover the reduction in levels of TNF- $\alpha$  in serum was associated with reduction in FBS and FBI which indicates the reduction in insulin resistance and consequently HbA1c in type 2 DM patients.

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