

Periodontal treatment in patients with diabetes mellitus type 1 and type 2: Case report

Reila Tainá **MENDES***

Fábio Anibal **GOIRIS****

Abstract

Introduction: It is unquestionable the influence of diabetes mellitus (DM) on the pathogenesis of periodontal disease. Both conditions have got a bidirectional relation on the inflammatory response. Patients with diabetes mellitus and without a proper metabolic control show a worse status of the periodontal disease and also more difficult in the glicemic control of DM. Types 1 and 2 of DM have their particularities and clinical differences related to the metabolic control or to the periodontal therapy. **Objective:** This paper reports two cases of patients with diabetes mellitus and periodontal disease, being one of DM type 1 and the other of DM type 2. **Conclusion:** The post-operative result showed resolution of the periodontal inflammation in both cases. After therapy, there were no periodontal pockets nor suppuration or bleeding on probing. However, the clinical management of both forms of DM was individualized. The use of systemic antibiotics associated to periodontal therapy was necessary only for the patient with type 1 DM.

Keywords: Diabetes mellitus. Periodontitis. Therapeutics.

How to cite this article: Mendes RT, Goiris FA. Periodontal treatment in patients with diabetes mellitus type 1 and type 2: Case report. Dental Press Implantol. 2012 July-Sept;6(3):34-42.

» The authors inform that they do not have no associative, commercial, intellectual property, or financial interests representing a conflict of interest in products and companies described in this article.

Contact address

Reila Tainá Mendes
Av. Gal. Carlos Cavalcanti, 4748 — UEPG Bloco M — Uvaranas
Zip Code: 84.030-900 — Ponta Grossa/PR - Brazil
E-mail: reila_tm@hotmail.com

Submitted on: September 08, 2011
Reviewed and received on: November 30, 2011

*Specialist in Periodontics. MSc and PhD student in Therapy Applied to Clinical Dentistry, Ponta Grossa State University.

**Specialist and MSc in Periodontics, PhD student in Therapy Applied to Clinical Dentistry and Associate Professor of Periodontics, Ponta Grossa State University.

Introduction

Periodontal disease and diabetes mellitus have a close relationship related to the inflammatory response.¹ Microbial biofilm is the main etiologic factor of periodontal disease² and, although responsible for the beginning of process, the bacteria present in this biofilm and which colonize the subgingival area are unable to cause the disease by themselves. It is essential the existence of a susceptible host.^{3,4} Therefore, there are biologic conditions which interfere on the disease progress: The *risk factors*.^{5,6} Nowadays, two risk factors are accepted and proven by epidemiological and longitudinal studies: The smoking and the diabetes mellitus.⁶

Diabetes mellitus (DM) is the most common human endocrine disorder⁷ and represents a heterogeneous group of clinical and genetics alterations due to abnormal level of blood glucose⁸ and disorders on the lipids and carbohydrates metabolism.⁹ Chronic hyperglycemia, its main characteristic, its due to the lack of insulin secretion by pancreas β cells, by the muscle and the liver's resistance to the insulin action, or these both situation contributes in the same way to the pathologic state. It results into damage in different organs: Heart, eyes, livers, nerves and vascular system.⁸ The most common symptoms of DM are: Polyuria, polydipsia and polyphagia; and the classical signs of the disease are retinopathy, nephropathy, neuropathy, macrovascular disease and changes in tissue healing. Therefore, diabetes mellitus have a huge impact over the whole body tissues, including the mouth. Evidence shows that DM, especially when non treated, increases the prevalence and incidence of gingivitis and periodontitis, being an important and independent risk factor to periodontal disease.¹⁰

An observational study pointed out the prevalence of gingivitis and periodontitis among a diabetic population being of 55% and 35,3,% respectively. This data

denotes the oral care as an important factor not only for an improvement to the oral health but as a factor that contributes to the glycemic control in diabetic patients.¹¹ Type 1 DM is diagnosed in children and young adults and its due to an autoimmune destruction of pancreas β cells in the Langerhans islet, leading to a considerable reduction on the insulin production.^{9,10} Type 1 DM is generally associated to more severe forms of periodontitis. On the other side, type 2 DM affects adults on the fourth decade of life, and its main characteristic is an increase on the insulin resistance, which leads to chronic hyperglycemia.¹⁰

This work presents two cases of patients with periodontal disease, being one with T1DM and the other with T2DM. It was approached the most important characteristics and clinical, therapeutical and pharmacological differences between both forms.

Case report 1

Female, seventeen-year-old patient, was diagnosed with type 1 DM at 9 years of age. The treatment applied for this disease was systemic administration of insulin. Severe periodontal defects were present, including spontaneous gingival bleeding with exudates and periodontal pockets with 7 millimeters of depth. By the initial clinical examination, the patient presented Visible Plaque Index of 100%, being 3 the score for the Gingival Index in 60% of the teeth (upper and lower), with gingival pain. Inflammatory gingival hyperplasia and pathological tooth mobility was one notable characteristic, especially on the maxillary anterior teeth (Fig 1 A and B). Trauma from occlusion was also present at this region and turned the teeth into another position. Radiographies show huge bone loss, especially on the maxillary and mandibular anterior teeth (Figs 2 A and B). The patient was diagnosed as being affected by aggressive localized periodontal disease.¹² The first part of the treatment was scaling and root planning



Figure 1 - Images showing clinical aspect of type 1 diabetes patient. **A, B)** Initial aspect. It can be observed gingival hyperplasia, pathological dental migration and spontaneous bleeding. Also one can notice the presence of microabscesses in the region of teeth 13, 32 and 42. **C)** Realization of periodontal surgery with modified Widman flap. **D)** Clinical aspect one year after conclusion of periodontal therapy of the patient.

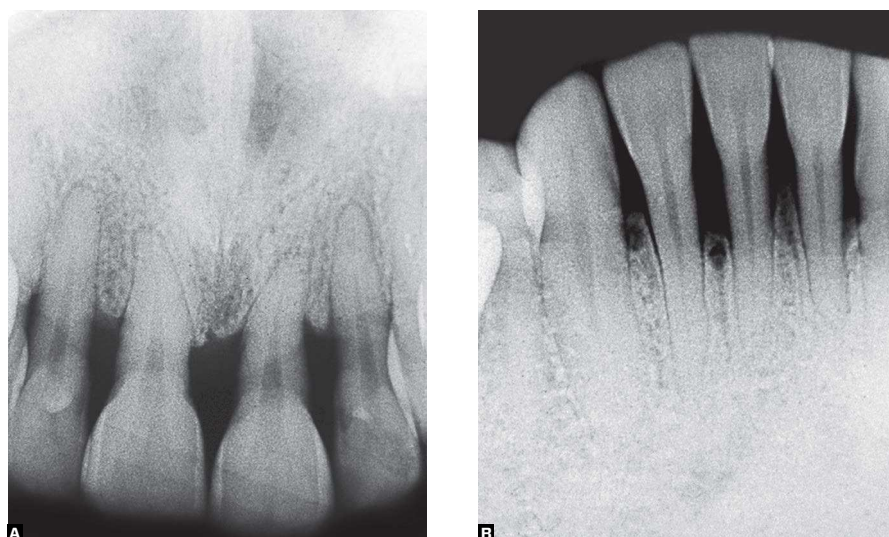


Figure 2 - **A, B)** Initial radiographic aspects of type 1 diabetes patient. It can be observed periodontal destruction with apical migration of alveolar bone crests.



Figure 3 - Clinical aspect of patient with type 1 DM five years after periodontal therapy.

and oral hygiene education. Occlusal adjustment was performed by selective grinding. Additionally to the mechanical therapy, Amoxicillin 500 mg and metronidazole 400 mg were administered for 10 days.¹³ The patient realized mouth rinses with chlorhexidine 0.12% twice daily. Thirty days after the treatment, the inflammatory state was reduced; reduction on the probing depth and clinical attachment gain were observed, as well as reduction on the teeth mobility. Nevertheless, the mandibular anterior teeth still showed deep periodontal pockets, being necessary a surgical approach to treat them. It was also performed modified Widman flap surgery (Fig 1C). Prosevation and reevaluation of treatment were performed after 2, 4, 6 and 12 months aiming to observe the stability of the treatment and evaluate the necessity or not of a new intervention. One year after the initial therapy, there was no inflammation and the teeth naturally migrate to them proper position (Fig 1D). The Gingival Index and the Visible Plaque Index were approximately 15%, which denotes

the efficacy of the orientation related to the oral care. After five years (Fig 3), it was observed stability of the treatment.

Case report 2

Male, forty-three-year-old patient, presented T2DM. The disease was controlled only with alimentary diet. The patient also presented periodontal defects, which included gingival bleeding, deep periodontal pockets (about 6 mm) especially on the maxillary incisors. Visible Plaque Index was 70% and the Gingival Index was 2, with bleeding on probing. The patient did not present teeth mobility nor gingival hyperplasia (Fig 4A and 5).

Trauma from occlusion was not present. The patient was diagnosed as affected by a generalized chronic periodontal disease.¹² The initial treatment was performed by scaling and root planning, followed by oral hygiene instruction. The patient realized mouth rinses with chlorhexidine 0.12% twice daily. Systemic antibiotics were not necessary. After 30 days of this treatment, the inflammation was completely reversed. Visible Plaque Index and Gingival Index were reduced, surrounding 15%. This reduction was due to the reinforcement of the oral hygiene orientation and biofilm control. Just like in the previously described first case, preservation and reevaluation were performed after 2, 4, 6 and 12 months. One year after the treatment, periodontal pockets or bleeding on probing were absent (Fig 4B).

It is noteworthy that both patients received a proper glycemic control and received medical care related to de diabetes mellitus control. They also signed an informed consent allowing their information to be published.

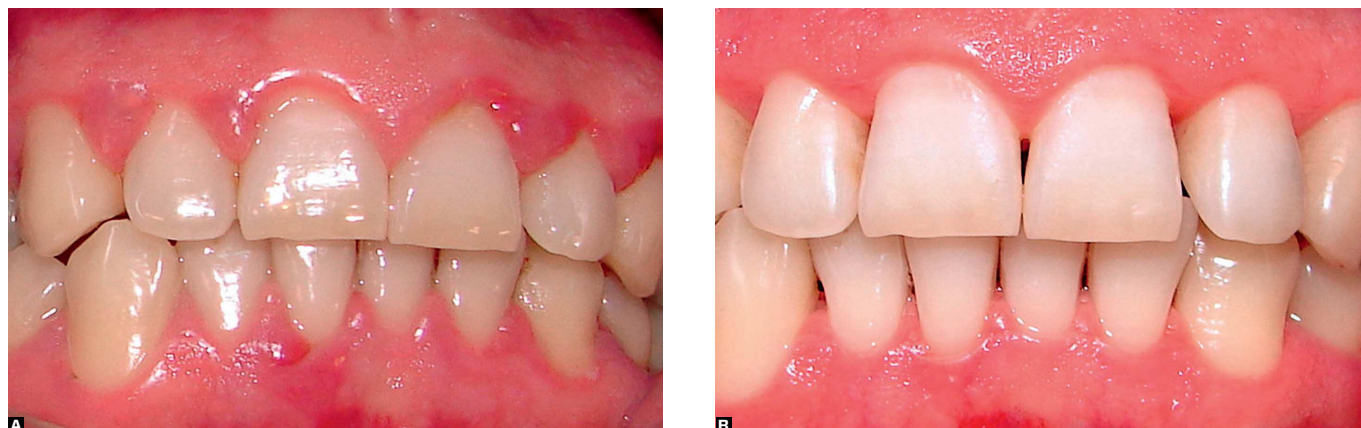


Figure 4 - A) Clinical aspect of type 2 diabetes patient. It can be observed hyperplasia in the papillae region. **B)** Clinical aspect one year after periodontal therapy conclusion of the patient..

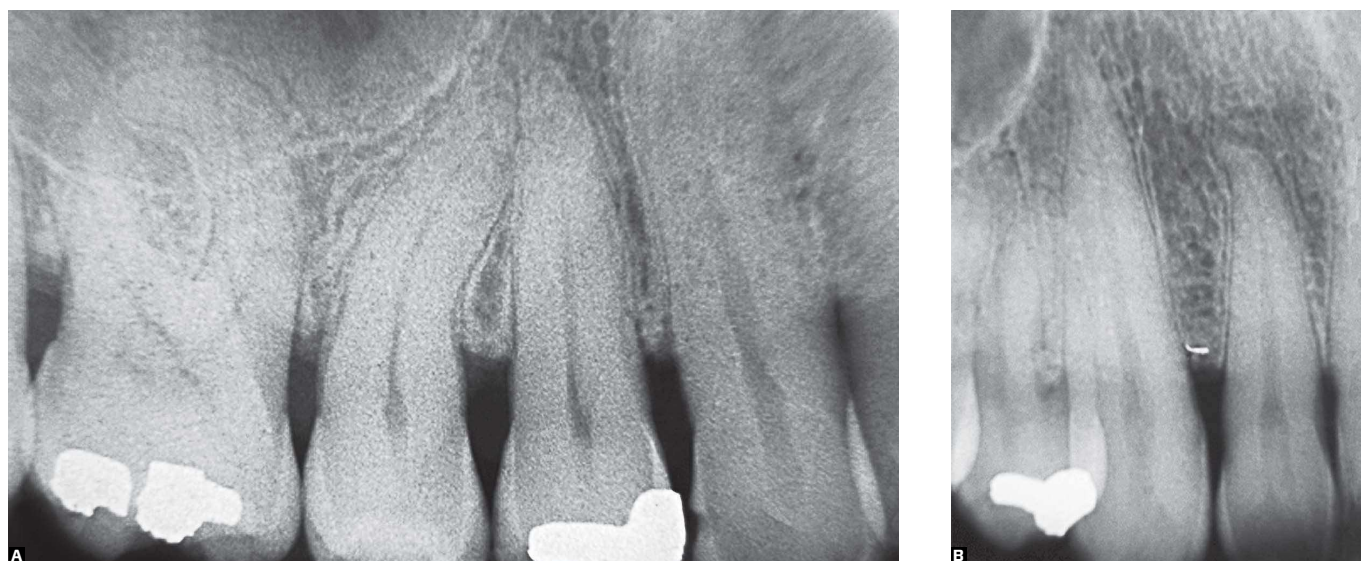


Figure 5 - Initial radiographic aspect of type 2 DM patient. It can be observed mild horizontal bone loss.

Discussion

The most important systemic alterations due to diabetes mellitus are the hyperinflammatory tissue conditions and alterations on the collagen structure. There is an association between the immune response alteration and the presence of *Advanced glycation-end products* (Age) in the bloodstream. This products are connected to

specific receptors present on the monocyte membrane named RAGE (ligation Rage/Age) resulting in an increased production of pro-inflammatory cytokines such as Interleukin 1 (IL-1), Interleukin 6 (IL-6) and Tumor Necrosis Factor Alpha (TNF- α).¹⁴ The patient with diabetes also presents an exaggerate response of the innate immunity, with dysfunction of the polymorphonuclear

lymphocytes, which leads to a reduction on the host defense system and allow the presence of bacteria inside the tissues.¹⁵ Related to the periodontal tissues, the hyperglycemia is characterized by an increased in IL-1 β , IL-6, IL-8, TNF- α , PGE₂, as well as a reduction on the collagen production followed by its lack on the osteoblasts production. There is an imbalance between osteoblasts and osteoclasts, with predominance of this last one, which leads to a reduction on the bone formation and increases the resorption of the mineralized tissues.¹⁶

In a comparative study between the DM types 1 and 2 related to the severity of periodontitis, type 1 DM was associated to a higher loss of tissue and the patients affected were mainly young. Moreover, in the patients diagnosed with type 1 DM, there was a higher concentration of IL-1 β and TNF- α on the crevicular fluid. Therefore, theoretically the patients with type 1 DM may be classified as having an aggressive form of periodontal disease.⁷ This situation that was observed in the present work. The T1DM patient showed a more severe form of periodontal disease and higher tissue destruction when compared with the patient of the second case. The first patient was also classified as affected by an aggressive form of periodontal disease, whereas the patient with type 2 DM was classified as affected by a chronic form of periodontal disease.

Moreover, in both cases previously described there is an important difference between the types 1 and 2 of DM. The first one presented an exacerbated state of periodontal inflammation, with the presence of micro abscesses, tooth mobility and spontaneous bleeding. In the patient with T2DM, the periodontal inflammation showed an acquiescence bias.

Other pathogenic characteristics of DM types 1 or 2 are a lack on the collagen synthesis by the fibroblasts affected and an increase on the production of metalloproteinases such as collagenase, which contributes

to the loss of periodontal insertion.¹⁶ Therefore, chronic hyperglycemia creates an environment compared to an acute inflammation, with an increase on the vascular permeability and an increase on the leukocyte adhesion on the endothelial tissue.¹ The patients with T1DM also presented a more severe status of the periodontal disease due to a higher concentration of IL-1 β e TNF- α in the crevicular fluid when compared to the patients with T2DM⁷, which was observed on the presented cases.

Lappin et al¹⁷ showed that patients with T1DM had defects on the bone formation, which impair the host response to the periodontal treatment. Low levels of osteocalcin (a biomarker of bone formation) in patients with T1DM is a suggestion that these patients have got a reduction on the bone repair, which turns them to be more susceptible to the progress of periodontal disease. This situation may contribute to the severity of the periodontal inflammation showed in the first case presented. Besides that, RANKL — a TNF receptor protein — is an important factor for differentiation, growing and activation of osteoclasts, and is also related to bone resorption. High levels of RANKL are associated to bone resorption on periodontitis. The levels of RANKL are dependent of OPG (osteoprogenin) expression, a natural inhibitor of RANKL. Image analysis showed high levels of RANKL in inflamed periodontal tissues in patients with T1DM and low levels of OPG. This condition leads to bone resorption and loss of clinical attachment especially in patients with diabetes mellitus. The two systems which modulate bone resorption, RANKL and OPG, present specific relationships: RANKL protein is associated to lymphocytes and macrophages whereas OPG is related to endothelial cells. The higher is the level of RANKL, more severe is periodontitis. Periodontal therapy has an important factor in reducing RANKL expression in the inflamed periodontal tissues. Not only periodontal therapy when associated to local injection of OPG does reduce RANKL expression in alveolar bone affected by periodontitis, but it increases OPG expression as well.¹⁷

The bases of periodontal therapy are the same for patients with diabetes or not.¹⁸ These bases are also applied in the same way for patients with T1DM or type 2; and the clinical result of the therapy shows resolution of the periodontal inflammation, reduction on the probing depth and clinical attachment gain. However, the gingival hyper-inflammatory state, especially in patients with T1DM, requires a clinical management which includes a systemic care related to the glycemic control. This control is determinant on the periodontal disease progress and on the level of pro-inflammatory cytokines present on the crevicular fluid. Researches show that periodontal therapy may reduce hyperglycemia present in patients with DM.⁸ In both cases presented above, the patients received medical care associated to periodontal treatment, since both pathologies have a bidirectional relationship. Therefore, related to the severity of periodontal disease, a surgical complementation of the basic periodontal therapy may be necessary sometimes, just as it was performed on the first case.

Evidence shows that mechanical debridement not always is enough to treat the disease when facing a more severe periodontal destruction, which imply the use of systemic antibiotics just as it was done in the case 1 (patient with T1DM). A proper evaluation of the periodontal infection state, such as the detection of the presence of recurrent acute inflammation and micro abscesses formation in diabetic patients is essential to plan a proper treatment management. Moreover, it was shown that periodontal therapy associated to doxycycline was related to better results in the treatment of patients with T1DM¹⁹

In a clinical trial which involved non surgical periodontal therapy in patients with T2DM, it was shown a reduction in the level of reactive C protein after three months of periodontal treatment, such as reduction on

the bloodstream level of IL-4, IL-6, IL-8 e IL-10. These findings show that periodontal therapy may reduce systemic inflammation (with a decrease on some circulating inflammatory cytokines levels), which is relevant to the diabetic patient,²⁰ since such factors are related to periodontal destruction.¹⁶ The periodontal statement of non controlled diabetic patients is worse than those who perform a proper glycemic control.²¹ In both presented cases the patients realized a glycemic control adjunct to periodontal therapy.

Evidence shows that the treatment of chronic periodontal infection is important for the patient with diabetes and sometimes periodontal surgery may be necessary.²² Even dental implants with satisfactory osseointegration may be obtained in patients with DM types 1 or 2, once the patient have a proper glycemic control. However, the implants are not indicated to those patients who do not control the glycemic level because of its negative effect related to osseointegration and accumulation of AGEs on the blood and on soft and hard tissues of the peri-implantar region.¹⁶

Auyeung et al²⁴ examined 100 diabetic patients, of which 72 showed severe periodontal disease and besides that, it was not found patients with DM who present a healthy periodontal status. The authors also showed that non surgical periodontal therapy resulted in benefits to the patients with T2DM, not only in mild periodontitis, but in its severe form as well. The second case previously presented did not required a surgical approach. Moreover, the periodontal statement had huge relevance related to the metabolic condition of the patients with T2DM, including reduction of the hyperglycemia after the periodontal therapy.²³

Aspirello et al⁷ pointed that the patients with T1DM generally need a different approach, since type 1 shows more severe periodontal complications, such as a higher

duration of the disease, being also related to the aggressive form of periodontitis. This situation also agrees with the cases shown in this work. Llambés et al²⁴ pointed that the systemic use of antibiotics added to periodontal therapy in the treatment of patients with types 1 or 2 of DM were successfully reported in literature with better results than periodontal therapy by itself. In the first case, periodontal therapy was associated to administration of amoxicillin and metronidazole,¹³ which showed satisfactory results.

Facing the particularities related to each type of diabetes mellitus, being the patients with type 1 related to a more severe form of periodontal disease, the treatment to be applied may be individualized to each patient. It may be suggested that more frequently the patients with type 1 DM may obtain a better result when the periodontal therapy is associated to the use of antibiotics. Moreover, it is important to reinforce that the periodontal therapy should be performed in conjunction with the patient glycemic control, no matter the patient is affected by type 1 or type 2 of DM; it leads to a better statement of the mouth or the general health of the patient.

Conclusion

- 1) Efforts may be done in order to prevent periodontal disease in patients with diabetes mellitus, especially those who have already presented some form of periodontitis since these patients are more susceptible to a more severe form of the disease.
- 2) The initial periodontal therapy is the same for patients with DM or not, so it is the treatment of patients with type 1 or type 2 of the disease. However, T1DM owes more attention related to medical and to the periodontal care because of its more aggressive form of the disease.
- 3) The clinical periodontal statement is generally more severe in patients with diabetes type 1 when compared to patients with type 2, which sometimes requires a different clinical approach, such as a surgical procedure or the use of antibiotics. Both cases presented showed satisfactory results despite the type of diabetes or the performed therapy.
- 4) The presence of diabetes by itself is not an impediment to periodontal treatment surgical or not. The determining factor to the therapy's success is the trilogy glycemic control, medical care and dental treatment.

REFERENCES

1. Sima C, Rhourida K, Van Dyke TE, Gyurko R. Type 1 diabetes predisposes to enhanced gingival leukocyte margination and macromolecule extravasation in vivo. *J Periodont Res*. 2010;45:748-56.
2. Hamp SE, Nyman S, Lindhe J. Periodontal treatment of multirrooted teeth. Results after 5 years. *J Clin Periodontol*. 1975;2(3):126-35.
3. Heller RA, Schena M, Chai A, Shalon D, Bedilion T, Gilmore J, et al. Discovery and analysis of inflammatory disease-related genes using cDNA microarrays. *Proc Natl Acad Sci USA*. 1997;94(6):2150-5.
4. Page RC, Kornman KS. The pathogenesis of human periodontitis: an introduction. *Periodontol2000*. 1997;14:9-11.
5. Clarke NG, Hirsch RS. Personal risk factors for generalized periodontitis. *J Clin Periodontol*. 1995;22(2):136-45.
6. Albandar JM. Global risk factors and risk indicators for periodontal diseases. *Periodontol2000*. 2002;29:177-206.
7. Aspriello SD, Zizzi A, Tirabassi G, Buldreghini E, Biscotti T, Faloia E, et al. Diabetes mellitus-associated periodontitis: differences between type 1 and type 2 diabetes mellitus. *J Periodont Res*. 2011;46:164-9.
8. Mealey BL, Ocampo GL. Diabetes mellitus and periodontal disease. *Periodontol 2000*. 2007;44:127-43.
9. Diabetes and periodontal diseases. Committee on Research, Science and Therapy. American Academy of Periodontology. *J Periodontol*. 2000 Apr;71(4):664-78.
10. Mealey BL, Oates TW. Diabetes mellitus and periodontal disease – AAP-Commissioned Review. *J Periodontol*. 2006;77:1289-303.
11. Silva AM, Vargas AMD, Ferreira EF, Abreu MHNG. A integralidade da atenção em diabéticos com doença periodontal. *Ciênc Saúde Colet*. 2008;15(4):2197-206.
12. Armitage GC. Periodontal diagnoses and classification of periodontal diseases. *Periodontol2000*. 2004;34:9-21.
13. Silva MP, Feres M, Siroto TA, Soares GM, Mendes JA, Favari M, et al. Clinical and microbiological benefits of metronidazole alone or with amoxicillin as adjuncts in the treatment of chronic periodontitis: a randomized placebo-controlled clinical trial. *J Clin Periodontol*. 2011;38(9):828-37.
14. Lalla E, Cheng B, Lal S, Kaplan S, Softness B, Greenberg E, et al. Diabetes mellitus promotes periodontal destruction in children. *J Clin Periodontol*. 2007;34:294-8.
15. Graves DT, Liu R, Oates TW. Diabetes-enhanced inflammation and apoptosis: impact on periodontal pathosis. *Periodontol2000*. 2007;45:128-37.
16. Javed F, Romanos GE. Impact of diabetes mellitus and glycemic control on the osseointegration of dental implants: a systematic literature review. *J Periodontol*. 2009;80(11):1719-30.
17. Lappin DF, Eapen B, Robertson D, Young J, Hodge PJ. Markers of bone destruction and formation and periodontitis in type 1 diabetes mellitus. *J Clin Periodontol*. 2009;36:634-41.
18. Silvestre FJ, Miralles L, Llambes F, Bautista D, Solá-Izquierdo E, Hernández-Mijares A. Type 1 diabetes mellitus and periodontal disease: relationship to different clinical variables. *Med Oral Patol Oral Cir Bucal*. 2009;14(4):175-9.
19. Martorelli de Lima AF, Cury CC, Palioto DB, Duro AM, Silva RC, Wolff LF. Therapy with adjunctive doxycycline local delivery in patients with type 1 diabetes mellitus and periodontitis. *J Clin Periodontol*. 2004;31(8):648-53.
20. Correa FOB, Gonçalves D, Figueredo CMS, Bastos AS, Gustafsson A, Orrico SRP. Effect of periodontal treatment on metabolic control, systemic inflammation and cytokines in patients with type 2 diabetes. *J Clin Periodontol*. 2010;37:53-8.
21. Campus G, Salem A, Uzzau S, Baldoni E, Tonolo G. Diabetes and periodontal disease: a case-control study. *J Periodontol*. 2005;76(3):418-25.
22. Westfelt E, Rylander H, Blohmé G, Jonasson P, Lindhe. The effect of periodontal therapy in diabetics. Results after 5 years. *J Clin Periodontol*. 1996;23(2):92-100.
23. Auyeung L, Wang PW, Lin RT, Hsieh CJ, Lee PY, Zhuang RY, et al. Evaluation of periodontal status and effectiveness of non-surgical treatment in patients with type 2 diabetes mellitus in Taiwan for a one-year period. *J Periodontol*. 2011 Jun 21.
24. Llambés F, Silvestre FJ, Hernández-Mijares A, Guiha R, Caffesse R. Effect of non-surgical periodontal treatment with or without doxycycline on the periodontium of type 1 diabetic patients. *J Clin Periodontol*. 2005;32:915-20.